CRANFIELD INSTITUTE OF TECHNOLOGY

SCHOOL OF MANAGEMENT

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RESEARCH INTO INDUSTRIAL CONCENTRATION IN EUROPE - A SYNOPSIS AND APPRAISAL OF WORK UNDERTAKEN AT CRANFIELD FOR THE COMMISSION OF THE EUROPEAN COMMUNITIES

A submission of published work for the degree of
Doctor of Philosophy under Regulation 14.9

INTRODUCTION - and declaration under Regulation 14-9(e)

This report is not a thesis for the degree of Ph.D. but is an "exposition" referred to in Regulation 14-9 of the Institute, which allows the presentation of published work on one particular theme, instead of an original thesis. The publications submitted with this exposition are the reports of four studies of the evolution of concentration in the United Kingdom - (i) in paper manufacture and conversion, (ii) certain parts of the textile industry, (iii) selected vehicle accessories and (iv) press and general publishing. These studies were undertaken under contract for the Commission of the European Communities and form part of an extensive research programme directed by the Directorate General for Competition. The four projects were undertaken over the period April 1974 to November 1977.

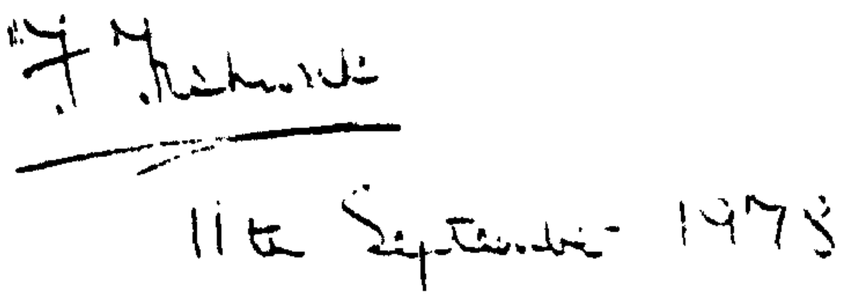
For the first of these projects a full-time research associate (Mrs. W. Hull) was employed. She was responsible for most of the data collection and prepared the first draft of much of this report. The other three projects were my own exclusive responsibility and the texts of the reports were entirely written by me - assistance being confined to clerical staff for data collection and a research assistant for data processing. Mr. Robert Cornu negotiated the first two of the contracts and assisted in communication with the predominantly French-speaking liaison staff in Brussels but he was not involved in any of the actual investigations.

The four projects were undertaken in accordance with guidelines prescribed by the Directorate General for Competition. These guidelines changed over the 1974-7 period and this is reflected in the reports. Because the statistical framework and methods of analysis were defined by the Commission, the investigations and the reports do not entirely reflect my own views on the analysis of concentration. For this reason this exposition of the work is of somewhat greater length than that which Regulation 14-9 appears to imply.

Chapter One contains an explanation of the Commission's interest in concentration as an aspect of market dominance, followed by summaries of the relevant literature and of empirical research into the effects of concentration. The objective of this chapter is to place the studies financed by the Commission into the context of economic theory and recent research by industrial economists. Chapter Two examines problems of definition and of sample design in investigations of this kind. Chapter Three presents and compares indices of concentration based on the entire sample of firms. Chapter Four is concerned with the statistical analysis of oligopoly and concentrates particularly upon the innovative parts of the Commission's methodology. Chapter Five is a preliminary assessment of the value of the studies and contains some tentative suggestions for changes in the existing approach.

Throughout this exposition I have drawn evidence from the four reports but have only occasionally quoted from any of the large number (over 100) reports completed by other research organisations in the nine member countries of the European Economic Community. I

have estimated the total cost of this research programme at December 1977 prices and up to that date to be around £1.2 millions.



ACKNOWLEDGMENTS

The assistance of people who helped in the preparation of each of the four studies is acknowledged at the beginning of each report. Most of this synopsis has been typed by Filomena Martignetti who has coped most patiently with the extensive algebraic notations. I wish to express my appreciation to her and also to Janis Gilbert who prepared the diagrams in Chapters Three and Four.

B. Definition of Units of Concentration (Enterprises) 30

1. The 1976 guidelines of the Commission 30

2. The paper industry study 31

3. The application of the guidelines to the textile study 32

4. The application of guidelines to the publishing study 33

5. The report on tyres 33

6. Some comments on the enterprise and activity-unit approaches 33

7. Inter-company links 34

C. Definition of the Variables - Concentration of What? 36

1. The recommendations of the Commission and variables used in Cranfield reports 36

2. A criticism of the Commission's choice of variables 38

3. The choice of a variable for measurement of dimension 42

D. A Post-Script to Chapter Two 43

CHAPTER THREE: MEASURES OF CONCENTRATION RELATED TO THE TOTAL SECTOR 44

A. Introduction - The Two Elements of Concentration 44

B. Measures Related only to Inequality 46

1. The coefficient of variation 46

2. Transformation to logarithms, the lognormal distribution and the Lorenz Curve 47

TABLE OF CONTENTS

CHAPTER ONE: CONCENTRATION, COMPETITION AND DOMINANCE 1

A. The Reasons for the Commission's Interest in Concentration 1

B. The Traditional Concept of Dominance or Power over the Market 2

1. Measurement and definition of monopoly power in an industry 2

2. Concentration, size and profit - empirical studies 6

C. The Commission's Approach to Analysis of Oligopoly 15

1. Linda's perspective on competition ... 15

2. Some comments on Linda's approach to oligopoly 17

D. Aggregate Concentration - Does it Receive Sufficient Attention? 21

E. Summary and Conclusions 22

CHAPTER TWO: DEFINITION OF SECTORS, UNITS AND VARIANCES ... 24

A. Definition of Sectors: Concentration Within What? 24

1. Theoretical background 24

2. The practice adopted by the Commission 25

3. The effect of narrower definition on concentration and its significance ... 26

4. The importance of foreign trade 29

3. The Gini coefficient 52

4. The lognormal distribution in statistical studies of concentration ... 54

5. Asymmetrical log-distribution and its consequences 57

6. Concluding remarks on measures based only on inequality 60

C. Other Measures Based on the Entire Sample ... 61

1. Herfindahl-Hirschman index 61

2. The entropy measure 64

3. The Rosenbluth index 66

D. Conclusions 66

CHAPTER FOUR: STATISTICAL ANALYSIS OF OLIGOPOLY 67

A. Introduction 67

B. Earlier Attempts to Measure Inequality Within Oligopoly 67

1. Exponential functions (simple and modified) 67

2. Hart's summary concentration measure ... 71

C. The Evolution of the Linda Index up to 1977 71

1. Application and interpretation of the Linda index 1967-71 72

2. The application of the Linda Methodology 1972-7 73

D. Validation of the Linda Index 75

1. Introduction 75

2. Linda indices in the four Cranfield projects 77

3. Some experimental tests of the Linda minimum and consequent conclusions ... 79

E. Proposed Changes in the Application of the Linda Index 82

1. Redefinition of the Linda minimum ... 82

2. The degree of oligopoly 83

3. The degree of inequality within the oligopolistic arena 86

4. Consequent changes in the Linda methodology 86

F. The Degree of Dynamism 86

G. An Evaluation of the Linda Methodology ... 88

1. General comments 88

2. Refinements appearing in the later reports (the three matrices) 88

3. Application of Linda analysis to different variables 89

4. A final comment on these observations 90

CHAPTER FIVE: SOME CONCLUSIONS ABOUT THE VALUE AND DIRECTION OF THE RESEARCH 91

A. Total Costs of the Research 91

B. The Methodology in Relation to the Purposes of the Studies 92

C. Some Tentative Suggestions 93

D. A General Conclusion 95

REFERENCES 96

CHAPTER ONE: CONCENTRATION, COMPETITION AND DOMINANCE

A. THE REASONS FOR THE COMMISSION'S INTEREST IN CONCENTRATION

Article 3(f) of the Treaty of Rome 1957 states as one of the activities of the Community:-

"the institution of a system ensuring that competition in the Common Market is not distorted"

The principles of this system are set out in Articles 85 and 86 of the same treaty (see Ref. 5 for a lucid exposition).

The first paragraph of Article 85 reads as follows:-

"The following shall be prohibited as incompatible with the Common Market: all agreements between undertakings, decisions by associations of undertakings and concerted practices, which may affect trade between Member States and which have as their objective or effect the prevention, restriction or distortion of competition within the Common Market..."

The second paragraph of Article 85 describes any agreements prohibited under paragraph (1) as automatically void but the third paragraph provides for exemptions to be declared where an agreement can be shown to contribute "to improving the production or distribution of goods or to promoting technical or economic progress..." Such exemptions are subject to the further conditions that the consumer receives a "fair share of the resulting benefit," that no restriction is imposed which is not indispensable to these objectives and that competition is not eliminated.

Article 86 relates to what economists have usually described as "monopoly power." The first sentence reads as follows:-

"Any abuse by one or more undertakings of a dominant position within the Common Market or in a substantial part of it shall be prohibited as incompatible with the Common Market in so far as it may affect trade between member states."

This article then cites as particular examples of abuse "unfair" prices and trading conditions; restriction of production distribution or technical development to the prejudice of consumers; discrimination in any aspect of trading which might place other traders at a competitive disadvantage; the imposition of supplementary obligations on other trading parties which have no connection with the transaction to which they are attached.

Most of the cases considered by the European Court of Justice in the area of competition policy have arisen from appeals against decisions of the Commission under Article 85. Fewer cases have arisen under Article 86. The upholding by the Court in 1973 of an appeal by the Continental Can company indicated that there is onus of proof on the Commission to

identify the sections of the market in which a dominant position has been abused to the detriment of consumers. Commenting on this decision, Walsh and Paxton (Ref. 6, p. 127) pointed out that it left the definition of a dominant position vague and undefined. The decision, according to these authors, "focuses attention on the conflict between the greater degree of concentration of industry needed in the Community, to enable it to compete in the advanced technology markets and the obvious dangers of creating dominant positions through mergers."

The conflict is one long-recognised by economists. The Court of Justice has interpreted Articles 85 and 86 so as to presume collective agreements to be *a priori* against the public interests but to adopt no such presumption about dominant firms. This principle is broadly in line with British legislation. One effect is to compel the Commission of the European Communities to collect more information about market structure and behaviour, so that positions of dominance and abuse of those positions can be identified.

The programme of studies into the evolution of concentration in industries throughout the Community was begun in 1970. For a few years before that, the Commission had been studying the relationship between concentration and "dominance." In 1967, this relationship was among those considered by a committee of experts charged with the design of the methodology of the studies. Their report (Ref. 7) emphasised the need for data and for consistent statistical methods but some of the contributors pointed out that concentration indices cannot be interpreted directly as measures of the absence of competition. Houssiaux (Ref. 7, pp. 37-8) wrote "information about the structure (of an industry) is not sufficient to determine the actual behaviour of companies engaged in markets and its effects on competition."

In its First Report on Competition Policy (Ref. 8) published in April 1972, the Commission stressed as the main purpose of the studies the collection and analysis of information, "viewed from the angle of competition." In spite of the limitations stressed by the 1967 committee experts, the studies are predominantly concerned with structure. It may be argued that the quantitative study of industrial structure is a rational first stage of investigation by those responsible for anti-monopoly policy, for example Pickering (Ref. 9, p. 11). The value of the concentration studies in the formulation of policy under Articles 85 and 86 depends on how much complementary research will be undertaken into other aspects of restriction.

B. THE TRADITIONAL CONCEPT OF DOMINANCE OR POWER OVER THE MARKET

"It is a sign of the immaturity of the science of economics that the notion should persist that the competitiveness of the economy or a sector of the economy can ultimately be characterised by some single number or set of numbers" (J. B. Miller, Ref. 10, p. 119).

1. Measurement and Definition of Monopoly Power in an Industry

Although this topic has attracted the attention of economists for many years, some of the issues remain unresolved. The fundamental principles

of cardinal measurement are the existence of a zero value and a consistent unit. If the variable has more than one dimension then there must be a way of combining these dimensions so that the combination can be measured cardinally.

Most traditional attempts at measurement of monopoly power (or "market power" or "dominance") imply that a zero value is to be found in the theoretical model of perfect competition. This model has four basic assumptions:

(a) A very large number of independent, equal firms have identical costs of production and supply. (The horizontal demand curve implies an infinite number but this is inconsistent with the downward movement of price which is assumed to follow the entry of new firms.)

(b) These very numerous firms supply identical products, which are recognised as such by perfectly informed consumers who have equal access to each and are completely indifferent between them.

(c) There is complete freedom of entry and exit. Freedom of entry implies that firms entering an industry may sell their products at the same prices and with the same costs of production, distribution and selling as existing firms. If there were previously n firms, each with 1/n of the market, then the entry of one more firm would reduce every share to 1/(n+1).

(d) There is neither collusion between firms within the industry nor any agreement with potential entrants.

From this summary of the theoretical zero, it is clear that monopoly power has many dimensions. The main elements can be classified according to the assumptions of perfect competition:

(a) seller concentration, a term which is used to describe both a reduction in the number of firms and inequality of size. Diversity of operating conditions and costs is a factor in this concentration.

(b) heterogeneity of product, in terms of physical quality, of access to the consumer or of perception by the consumer. Product differentiation, by advertising or other means of creation of brand preference, is an important influence on heterogeneity.

(c) barriers to entry, which have been examined empirically and classified by Bain (Ref. 11). Among these are product differentiation (especially with consumer goods), economies of scale and the ownership or control by existing firms of essential supplies or outlets.

(d) collusion between firms and/or agreements with potential entrants to the industry.

Although seller concentration is only one element in this concept of power over a market, it is closely linked with some of the other elements. Economies of scale in relation to market size lead to a reduction in the number of production units and usually in the number

of companies. Product differentiation is easier when the number of firms is small-oligopoly, at least in a segment of a market, is a necessary condition for an advertising war. Reduction in the number of firms and growth in the absolute size of each increase both the facility and motive for collusion; the increased motive follows from interdependence. Growth in the size of firms is likely to lead to some vertical integration which affects (b) and (c). The implications of concentration in an industry for market dominance depend also on the structure of the customer group. Countervailing buying power can be of great importance, as was shown in the report on textile concentration (Ref. 2, p. 34-6).

Seller concentration is not, as some authors suggest, for example Ornstein (Ref. 12), merely a proxy for collusion in models of market power; it affects many of the other elements. The intertwining of seller concentration and the other components of monopoly make attempts at measurement very difficult. Authors have proposed measures of each of the different components: numerous measures of seller concentration; use of price-elasticity of demand for the individual firm's product relative to that of the industry (Ref. 13) or some index based on cross-elasticities (Ref. 14) to measure product differentiation; several alternative measures of barriers to entry (Ref. 11). These measures of the different components cannot be added or combined in any weighted average because of their interdependence.

Monopoly power therefore tends to be measured and indeed defined by reference to its effects rather than its component characteristics. Evely and Little (Ref. 15) defined it as the long-run ability to choose price or influence market price without forcing sales to zero, which combines the product differentiation and barrier to entry assumptions. This definition does not cover the degree of monopoly. The best known and apparently most used definition of monopoly remains that of Lerner (Ref. 16): $\frac{\text{price-marginal cost}}{\text{price}}$

This is based on the well known equilibrium of perfect competition where price = marginal cost and, in the long-run, price = long-run marginal cost = long-run average cost.

This theoretical definition of "monopoly profits" has been used in a number of studies published in recent years which have examined the relationship between concentration and profits. (The findings and the validity of these models are described in the next sub-section). An interesting attempt to approximate to the Lerner formula was made by Qualls in 1972 (Ref. 17). Empirical research had shown that long-run average cost (LRAC) is flat for a substantial range of output. Since long-run marginal cost (LRMC) is equal to LRAC over this range,* the Lerner formula is equivalent to

(i) $\frac{P - LRAC}{P}$ and, if one multiplies both numerator and denominator by the volume of output this is equivalent to the average over a number

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* $\frac{dC}{dq} = \frac{C}{q}$ when $\frac{d}{dq}\left(\frac{C}{q}\right) = 0$

of years of

(ii) $\frac{\text{Sales turnover - Total Costs}}{\text{Sales turnover}}$

Qualls pointed out the need to include in total costs the long-run opportunity cost of equity capital. Qualls' approximation to the Lerner measure of monopoly profits was

(iii) $\frac{\text{Net profit after tax - 6\% return on equity}}{\text{Sales turnover}}$

This is a definition of monopoly profits resulting from exploitation of monopoly power, not the existence of such power. It has some conceptual defects, quite apart from measurement inconsistencies, which may arise because of diversity of accounting procedures and distortions due to company taxation policies and the effects of inflation.

One conceptual weakness is failure to allow for vertical integration. This applies also to some of the ratio analysis prescribed by the Commission for the E.E.C. concentration studies. Two textile weaving firms may have similar sales turnover but if one also spins most of its own yarn it may be expected to earn higher profits. This defect can be overcome by the replacement of sales turnover in the denominator of the Qualls formula by value added. Average "monopoly profits" in an industry are then measured by

(iv) $\frac{\text{Total net profits after tax - C (total equity capital)}}{\text{Total Value added (= Net Output)}}$

C represents the long-run opportunity cost to shareholders; equity capital = shareholders' funds, including retained earnings.

Because of difficulties in definitions of net profit and equity capital, greater consistency might be obtained by using gross trading profits on the numerator, even though this fails to adjust for capital intensity. This measure was used in a recent study by Hart and Morgan (Ref. 18):-

(v) $\frac{\text{Value added - labour costs}}{\text{Value added}}$

This last formula demonstrates the second defect of the Lerner measure, of any ratio derived from it or indeed of any attempt to use profits as an indicator of exploitation of monopoly power. A monopolist or oligopolist is also likely to be a monopsonist or oligopsonist. Concentration in the product market will often be accompanied by concentration in the factor market. Little research appears to have been undertaken into the relationship between concentration and wage-rates. Phlips (Ref. 19) gives two main reasons for expecting wage-rates to be higher in oligopolistic industries - reward for higher productivity associated with economies of scale and part of a strategy of protection against new competition. A third might be added - the ability of organised labour to obtain a share of the "abnormal" profits. Gains

from dominance may be divided between shareholders and employees.

This introduces a third defect of the profit-margin concept: potential monopoly profits may be dissipated not only by payment of higher wages but also by "discretionary" expenditures by management and by the tolerance they provide for managerial inefficiency. Antipathy towards high profits among some powerful sections of political opinion may encourage "satisficing" policies. Under these, potential profits beyond the level required to satisfy shareholders are diverted to expenditures on promotion, research, welfare or even prestige. In the United Kingdom in 1970s, labour reduction is more difficult for larger than for smaller firms, because of the larger absolute numbers involved; part of any potential monopoly profits may be transferred to the cost of over-manning.

A fourth defect is perhaps the most obvious and the most important. Concentration usually (though not necessarily) implies large plant size or large-scale production operations, which may bring economies of scale and greater efficiency than would be possible in a more atomistic structure. To return to the Lerner formula, the excess (P > MC) may be due not so much to a rise in P through exploitation of monopoly power but to a fall in MC through greater efficiency (Phillips, Ref. 20, p. 247). The gains from greater efficiency may be distributed among shareholders (profits), employees (higher wages), management (greater discretionary expenditure and "slack") and consumers. What represents abuse of monopoly power as opposed to just reward for efficiency becomes a matter of value judgement.

The definition and measurement of power over the market has long attracted the attention of economists but the results of these deliberations leave most issues unresolved. Nowhere in the documentation provided by the Commission for the series of concentration studies is an attempt made to define dominance. In a paper given to a five-day seminar in Bruges in 1977, devoted entirely to E.E.C. competition policy, (Ref. 21), Schröter made it clear that no dogmatic definition is appropriate. Power over the market is perhaps more easy to recognise than to define or to measure.

2. Concentration, Size and Profits - Empirical Studies

(a) Inter-industry comparisons

In spite of the conceptual difficulties described in the last sub-section plus possible inconsistencies in the financial data used, certain English language journals have reported a remarkably large number of statistical investigations into the relationship between concentration and profits. Most of these have been on an industry basis, usually on U.S. data and referring either to 2-digit or 3-digit classes of the United States Standard Industrial Classification, equivalent to Orders and Minimum List Headings of the U.K. classification.

The method adopted in most of these studies is comparison of average profit rates in each industry over a period of time with a number of independent variables including concentration, barriers to entry (or some proxy measure) and, in most studies, growth of demand. The statistical

technique most generally used is multiple regression with a single equation.

Average profit rates have been measured in various ways:

$\frac{\text{net profits plus interest}}{\text{net assets}}$, $\frac{\text{net profits}}{\text{equity}}$, $\frac{\text{gross profits}}{\text{sales turnover}}$,

$\frac{\text{net profits - 6 per cent of equity}}{\text{sales turnover}}$ (Ref. 17) and even average share price (Ref. 12).

In most cases the average rate is total profits earned by major companies divided by the total denominator.

Concentration has usually been measured in the American studies by the percentage of industry sales accounted for by the four largest companies. (C_4) or by the eight largest (C_8). Some authors, for example Miller (Ref. 22), have included both (C_4) and ($C_8 - C_4$) as explanatory variables in their models on the grounds that the ability of the four largest firms to dominate depends on their size in relation to that of the next largest group of firms. (This principle is closely connected with the Linda index described in Chapter IV of this report.)

Barriers to entry were grouped in the pioneering work by Bain (Ref. 11) and a confirmatory investigation by Mann (Ref. 23) into three classes: very high, substantial and moderate to low. The criteria for classification were the ratio of minimum economic plant size to the total market; product differentiation and absolute advantages of existing firms. The qualitative and discrete nature of this variable is clearly unsatisfactory and subsequent investigators have tried alternatives including the advertising-to-sales ratio (Ref. 24);* average or median plant size (Ref. 18 and 25); average size of largest plants accounting for 50 per cent of employment (Ref. 26).

The majority of U.S. studies have shown that concentration has a statistically significant but small effect on profit rates. Bain (Ref. 11) and Mann (Ref. 23) showed that C_8 and barriers to entry each had an independent effect on profits and that in each case the influence occurred only after a threshold level of the independent variable had been exceeded. Their results have been challenged by other writers and there has been a series of papers, some of them remarkably polemical, devoted to the existence or non-existence of critical levels of concentration and entry barriers. The results of Qualls (Ref. 17), Duchesneau (Ref. 27) and Dalton and Penn (Ref. 28) provide stronger statistical proof of the Bain-Mann hypothesis than that provided by either of the original authors.

The results of British studies have been even less conclusive than those based on U.S. data. A study by Phillips (Ref. 25) based on 1951 Census of Production data showed a very weak but statistically significant correlation between gross profit margin on sales and the three-

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* This last variable has also been used as a separate independent variable in equations with a different measure of entry-barriers.

firm sales concentration ratio, C_3. He used multiple regression analysis which also took into account average plant size, as a proxy for barrier to entry, advertising to sales ratio, growth of output and a number of discrete factors represented by dummy variables. A study by Shepherd (Ref. 29) related gross margins to capital intensity, absolute size of the industry and growth of output as well as C_3. The influence of the concentration variable was found to be statistically insignificant.

Both of these studies encountered problems of multicollinearity and this was also evident in a detailed analysis by Holtermann published in 1973 (Ref. 26) and also based on the 1963 Census, together with Ministry of Labour data on net assets. Analysing gross profit margins for 113 industries (Minimum List Headings) Holtermann was able to explain 45 per cent of the variance in an equation with the following independent variables: C_5 (based on weighted averages of product sub-groups), the ratio of net assets to gross output, growth of sales 1958-63, advertising-to-sales ratio, capital expenditure in 1958 and 1963 as a percentage of 1963 sales and a measure of entry barrier based on average size of large plants. Neither concentration nor entry barriers emerged as significant influences. Holtermann reported the full correlation matrix and although she described multicollinearity as low, six of the fifteen coefficients of $r_{x_i x_j}$ were significant at the 1% level. Three of the six were between $^{x}C_5^{x_j}$ and one of the other variables.

Although multicollinearity may have reduced the partial regression coefficient between the gross profit margin and C_5 (the five-firm concentration ratio), Holtermann showed that the other variables in total explained only 28 per cent of the variance of C_5. She explained the statistical insignificance of C_5 by weaknesses in data and also a number of other factors, some of which are highly relevant to the studies of concentration sponsored by the EEC:-

(i) The 113 MLH industires are defined more according to physical similarities of products or similarity of factor inputs than homogeneity of end-use. Holtermann referred to the pooling of domestic glassware and car windscreens; in the Cranfield study of paper conversion (Ref. 1, p. 3) we referred to cardboard boxes and paper handkerchiefs. (This problem is discussed more fully in Chapter Two.)

(ii) The five-firm concentration ratio is a poor measure of market concentration because it disregards asymmetry between market shares of leading firms. This leads towards the Linda approach, described briefly in Section C below and in greater detail in Chapter Four.*

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* Holtermann referred to a measure of concentration by Mann which reflected this asymmetry. I could not find this either in the article by Mann referred to by Holtermann (Ref. 23) or in a number of other papers by this author.

(iii) The influence of concentration can be mitigated by availability of imports. This is particularly relevant to the paper and textile studies, where oligopolistic structures in the U.K. industries do not imply market power, since imports of some products account for over 50 per cent of U.K. sales.

(iv) There is no way of identifying how far high profits result from efficiency rather than market power or to what degree low profits result from protected inefficiency rather than competitive pressure.

When all the conceptual and statistical problems are considered, it is remarkable that significant relationships between concentration and industry profits have been observed. This means either that the influence of concentration on profits is so strong that it transcends all the factors which might obscure it in a statistical study or that the results are spurious. The second view was taken by Phillips in an article published in 1976 (Ref. 20). Many of the criticisms he presented have been made by other writers and have been summarised above but he added a number of new points. He criticised the calculation of industry profit ratios by the adding of profits for individual firms and then net assets, sales turnover or value added and division of the first total by the second. The result is equivalent to an average of company profit rates weighted by the dimension used as the denominator. This means that greatest weight is attached to the largest firms. Greater size is likely to be associated with greater gross profits in relation to sales and, where there are economies of scale, to greater net profits also. This identification problem, which I have already described on p. 6, is aggravated by the greater weight given to large firms.

Another of Phillips' criticisms concerns the linear specification of the regression equations used in most of the previous studies. For example, some authors have tested equations of the form

$$\frac{\text{Total Profits}}{\text{Total Sales}} = a + b\left(\frac{\text{Sales of largest 4}}{\text{total sales}}\right) + c\left(\frac{\text{Average plant size}}{\text{total sales}}\right) + d\left(\frac{\text{Advertising}}{\text{total sales}}\right)$$

Since total sales appears on the denominator throughout we can express this equation as

$$\text{Total profits} = a(\text{Total sales}) + b(\text{Sales of largest 4}) + c(\text{Av. plant size}) + d(\text{Advertising})$$

The likelihood that the coefficients a, b, c and d will be constant must be low. The linearity of the relationship had been questioned and indeed rejected in other studies; results derived from linear equations must be suspect.

Phillips concluded "Better theory, better data and above all, better econometrics are needed before policy can be based on anything other than in-depth studies of particular markets." (Ref. 20, p. 248)

Hart and Morgan conclude their recent study of market structure and economic performance (Ref. 18) with a slightly more positive view than that of Phillips. Although the familiar problem of multicollinearity affects their results they did find, from 1968 Census of Production data a significant, though small, correlation between concentration and gross profit as a percentage of value added. Because of the doubts about identification and specification expressed by Phillips they then used a lagged-change model, following earlier work by Cowling and Waterson (Ref. 30). For each industry, the dependent variable was the change in gross profit margins between 1963 and 1968 and the independent variable the change in concentration between 1958 and 1963:-

$$\text{Log}\left(\frac{\text{Gross profits}}{\text{sales}}\right)_{1968} - \text{Log}\left(\frac{\text{Gross profits}}{\text{sales}}\right)_{1963} = a + b\left(\text{Log } H_{63} - \text{Log } H_{58}\right)$$

where H is the Herfindahl-Hirschman index for each industry, explained on pages 61-2 below. The coefficient of b was not significant, although Cowling and Waterson had derived a marginally significant result with a slightly different sample and the use of 1953 to 1963 as the time-period for concentration increase.

It is clear that attempts to measure the effects of concentration on profits by econometric analysis of industry data face very large difficulties - resulting from data unreliability, statistical weaknesses and conceptual problems. Hart and Morgan conclude that such attempts must continue because, compared with the costly, labour-intensive alternative of detailed empirical study, they are very cost-effective. They may help us "to distinguish the wood from the trees which may be extremely important for purposes of economic policy."

(b) Inter-firm comparisons

Much of the discussion about the desirability of action by public authorities to intervene in markets with high seller concentration concerns the existence of economies of scale. The advantages of cost-reductions achieved through these economies may offset any adverse consequences for society of oligopoly or monopoly.

The inter-industry comparisons of average profits and concentration have been criticised because any positive relationship could be the result of economies of scale rather than exploitation of market dominance. If economies of scale exist at company level, and at the same time large companies are more likely to find themselves in positions of market dominance then one would expect a positive conrrelation between size and rates of profit.

Previous research into this hypothesis includes that of Hall and Weiss (Ref. 31) and Marcus (Ref. 32) for the United States, Samuels and Smyth (Ref. 33) for the United Kingdom.

Hall and Weiss used data for 1956-62 for 341 of the largest companies to check the following hypothesis attributed to Baumol (Ref. 34):-

$$\frac{\text{Net profit after tax}}{\text{Equity}} = a + \frac{b}{\text{Log (net assets)}} + \ldots$$

The hypothesis was also tested with net assets as the denominator of the dependent variable. Because the 341 companies were in different industries, Hall and Weiss included industry variables in their analysis- concentration and a weighted average of the growth in each of the previous five years of industry output. They also included as an independent variable the ratio of equity to total capital employed. All their multiple regression equations showed a significant (1%) negative value for b. The influence of industry concentration was less certain.

The relationship between size and profits in the U.S.A. was examined by Marcus (Ref. 32) in an industry-by-industry comparison over the three financial years 1959-60, 1960-1 and 1961-2. He used as the dependent variable the ratio of (net profits before tax plus interest) to total capital employed, which, as he pointed out, avoided variations due merely to different debt-equity ratios. He also used data for a wider range of firms - he did not confine the analysis to appropriate companies among the 500 largest. Another change in his approach, not explained in his paper, was the re-specification of Baumol's hypothesis by use of the logarithm of net assets instead of the reciprocal of the logarithm. The total number of firms included in his analysis appears to have been about 960 and these were divided into 118 industries; for each industry the number of observations was 3 (years) times the number of firms. Because each regression equation related to one industry and because the debt-equity ratio could now be omitted, Marcus could use simple regression equations. In 35 of the 118 industries he found significant positive correlation between profitability and size, in nine significant negative correlation and in 74 there was no correlation at the 5 per cent significance level.

These studies appear to have a common statistical weakness. Hall and Weiss used data for 341 firms, took six years of data for each and treated the sample as one of over 2,000 independent observations. In the course of our research on textiles, paper and publishing this approach was considered because it provides an attractive number of degrees of freedom! In all three cases I decided that rather than include data for individual years, it would be better to use the means of each company's rate of profit and size over these years. The principal objection to inclusion of observations for m firms in each of n years and regarding the mn values as independent is the relative consistency of the size variable. For each firm i, $(x_i - \bar{x})$ is likely to have the same sign in each of the n years. Similarly, the distribution of the residuals from the regression equation is unlikely to be random since a special factor for firm i may be repeated in each of the n years. Although the regression coefficients might not be seriously affected with a large sample, the implications for standard errors are difficult to assess. The number of degrees of freedom for tests of significance with k independent variables surely cannot be regarded as the usual (mn - k - 1), which is what the authors of both articles have assumed.

The doubts expressed in the previous paragraph apply more substantially to the work of Marcus than to that of Hall and Weiss because of the small samples within his industry groups. There is another statistical problem in both studies, the inclusion of the size variable on both sides of the regression equation. This problem is discussed on page 13

below. The main conclusion to be drawn from the two American studies is that there appears to be some positive correlation overall between size and profitability of American firms but the statistical evidence is weaker than it might first appear; correlation between size and profitability within industries remains unproven.

Samuels and Smyth (Ref. 33) used a sample of 186 companies drawn from manufacturing, distribution and mining. This sample was chosen at random from companies within each of ten size-groups. For each of the ten years 1954-63 the authors calculated the coefficient of rank correlation between size group and mean for all firms in that size group of (net profits before tax as a percentage of net assets). They carried out the same test on the averages over the ten years. Of the eleven rank correlation coefficients, two were significant at the ten per cent level (including the ten-year average), two at five per cent and four at one per cent or lower. All eleven were negative.

Samuels and Smyth went on to compare variability of profits with company size and found a negative relationship - larger firms showed greater consistency over time. They also examined the relationship between concentration and profit variability and concentration in an industry and found again that there was greater constancy in more highly concentrated industries. These further conclusions are much less surprising than their first.

Negative correlation between company size and profits is difficult to explain, particularly when it is derived by classification and ranking - the possibility that skewness within groups could distort the comparison of averages cannot be overlooked. The comparison of net profit before tax over net assets with net assets is also questionable because it can be distorted by variations in gearing, a point mentioned by Samuels and Smyth (Ref. 33, p. 128) but not checked statistically. The problem is demonstrated by the following example:-

	£000	
	A	B
(1) Equity capital	9,000	35,000
(2) Loan capital	1,000	15,000
(3) Net assets	10,000	50,000
(4) Net profit before tax + interest	1,000	5,000
(5) Interest payments (8%)	80	1,200
(6) Net profit before tax	920	3,800
(4) as % of (3)	10.0	10.0
(6) as % of (1)	10.22	10.86
(6) as % of (3)	9.20	7.60

One can argue that Firms A and B have achieved the same return on total capital employed, 10 per cent. Firm B has obtained a higher return on equity because of its higher debt-equity ratio; Firm A has

obtained a much higher rate of profit according to the Samuels-Smyth definition. If larger firms generally have a higher debt to equity ratio then this could account for at least part of the negative correlation found by these authors.

The concentration tables for textiles and publishing both show that net assets are more concentrated than equity capital, which implies that gearing is correlated with size. Without repeating the Samuels-Smyth research and including this factor, it is not possible to state how far their findings can be attributed to this distortion.

In the three industries in which sample sizes were sufficiently large - paper, textiles and publishing we computed regression equations between size and profitability. In no case was there any indication of significant correlation. When the results are compared in chronological order:- paper (Ref. 1, p. 63), textiles (Ref. 2, p. 73) and publishing (Ref. 4, p. 22) it appears that diminishing attention was devoted to this topic. This is not the case: there was merely a declining propensity to describe insignificant results.

The absence of any statistical correlation in any of our three studies is so complete that it cannot be attributed to statistical mis-specification. However, the question of specification should not be ignored. The previous studies described above used equations of the form

$$\frac{\pi}{S} = a + bS \qquad \frac{\pi}{S} = a + b \log S \qquad \text{and} \qquad \frac{\pi}{S} = a + \frac{b}{\log S}$$

(Samuels & Smyth) (Marcus) (Hall and Weiss)

π = profit
S = size variable

The Samuels-Smyth form is the one which we first tested in the course of the study of the paper industry. If one multiplies both sides by S it becomes

$$\pi = aS + bS^2$$

and the test is whether profits are related to the square of the size variable, e.g., net assets.

Marcus' equation becomes

$$\pi = aS + S(b \log S)$$

and that of Hall and Weiss

$$\pi = aS + \frac{bS}{\log S}$$

Each of these three hypotheses is too restrictive.

All we really wish to test is whether profit varies other than proportionately with size, that is whether $\frac{d^2\pi}{dS^2}$ differs significantly from zero over any range of S. One way to do this is to order the observations according to S, fit the equation $\pi = aS$ and test for the randomness of residuals. My own calculations on the textile and publishing data revealed remarkable randomness.

In considering the absence of a relationship in any of three studies it is important to recognise that economies of scale are most frequently found at the level of the plant. George (Ref. 35, p. 114) and Pickering (Ref. 9, p. 45) have suggested that "multi-plant" economies of scale, in management, marketing, research and development are limited.

Technical economies of scale usually require a threshold level of output beyond which there may be few advantages of increased plant size. In the textile industry of North-West industry, family businesses continue to remain profitable by concentrating on a narrow product range with volume just sufficient for least-cost production methods. The risks are high, because fixed costs of equipment bear a similar ratio to output as those in larger, more diversified plants, while because of specialisation orders show greater fluctuations. Profits are earned through the small companies' ability to exploit urgent requirements for sub-contract work or urgent customer orders.

In all three industries in which no correlation between size and profitability was found, the largest firms have wide product ranges within and, in some cases outside the industry. Even when size is linked with horizontal integration, as in textile weaving or paper manufacture, the large firms continue to operate a large number of comparatively small plants. The four largest firms in cotton and man-made fibre weaving in 1968 had average establishment size of 239 employees; for the next 61 largest firms the average size was 189 employees. In paper and board manufacture the eight largest firms have average establishment size of 567 employees, for the 20 next largest the average was 439, (Ref. 50, Table 42a). In publishing the reasons for the absence of a size-profitability relationship are more complex: the largest groups specialise in the production of large-volume popular newspapers and periodicals, sales of which have declined in recent years. This factor, combined with well-publicised labour-relations difficulties on the part of some of the larger firms, appears to have offset any economies of scale which may exist.

Besides the doubt regarding the extent of economies of scale in multi-plant and diversified firms, the absence of any relationship between size and profitability can be explained by the same factors listed above (p. 9) in connection with the concept of monopoly profits. These include the transfer of part of any gains from size to employees (higher wages or overmanning) or to discretionary expenditure by management (promotion, research, welfare or prestige). It is possible that potential gains from size may be partly dissipated in reduced efficiency. Publication of high profit figures by large firms may attract the attention of government departments (Price Commission or the Department of Fair Trading) or of political critics.

The main weakness of all the empirical studies into concentration and the level of industry profits, or size and company profits appears to be the use of profits as the dependent variable. Power over consumers in a market might be defined as the long-term excess of consumers' expenditure on the product over what that expenditure would be if more numerous and/or closer substitutes were available and if new competitors could enter the market more easily. This excess payment might result from higher prices or (in the case of deliberately restricted product life) from greater volume of purchases. The additional revenue to companies could be absorbed in many ways; only a small part of it might ultimately be included in "net profits before tax," as published in company accounts.

The statistical and conceptual difficulties surrounding studies of the relationship between profits, concentration and company size are well-known. Why then do such studies continue, with very rare methodological improvements? Econometric analysis has almost become a diversion away from the problems of measuring the multiple-dimension concept of market power. Although case studies and other empirical research into existence of market power are more labour-intensive and cannot be used for general policy formulation, a critical examination of the econometric analysis suggests that its contribution to such formulation has been very little.

C. THE COMMISION'S APPROACH TO ANALYSIS OF OLIGOPOLY

1. Linda's Perspective on Competition

The methodology prescribed by the Commission of the European Communities for the concentration studies includes the calculation of indices which relate particularly to oligopoly. These indices are described in Chapter Four. In this section I shall explain the view, which underlies this methodological innovation, that analysis of oligopoly requires a different approach from that traditionally applied to market structure.

This view was expressed by Linda in two articles the first published in 1967 (Ref. 36) and the second in 1972 (Ref. 37). Both these articles were in French and seem to have attracted comment only in French-language circles, at least until 1975. The 1972 article is considerably longer: the title is "Oligopolistic Competition and International Competition Policy" and the sub-title, "A New Approach to Competition and Concentration" demonstrates the author's view that his was a major analytical innovation.

Linda rejected the use of perfect competition as the theoretical maximum of competition. The existence of a very large number of equal firms producing identical products with no barriers to the entry of new competitors precludes major forms of competition - product differentiation and innovation. Analysis of market structure and behaviour based on departures from perfect competition is based on the false assumption that perfect competition would be ideal for consumers. However, this theoretical situation is inconsistent with economies of scale, with the earning of profits to finance product improvement and innovation and with the consumer's inability to choose between more than a limited

range of substitutes. "The perfect market can only be an oligopolistic market" (Ref. 37, p. 344).

By regarding product differentiation as a competitive strategy Linda was, as he acknowledged (Ref. 37, p. 328) adopting a diametrically opposite view from that of most other writers in this field. A similar contrast of view is to be found in his attitude towards freedom of entry. The erection of barriers to the entry of new firms is one of the strategies of modern oligopolistic competition (Ref. 37, p. 357). The existence of barriers is in some industries a powerful stimulus to substitution, innovation and technical progress. Barriers to entry need to be seen in a dynamic context, their creation is proof of the existence of competitive strategies.

In his discussion of barriers to entry Linda also questions the theory that prices are kept low by oligopolists to dissuade entrants, the theory of "limit price" or "entry-forestalling price" (Bain, Ref. 11, p. 242-5). Linda sees as the major barrier to entry the existence of deliberately created excess capacity which can be used by existing firms to take advantage of any expansion of the market or to defend themselves against new competitors. High prices, required to finance excess capacity, may therefore be part of a company's defence against the threat of competitors rather than an indication of the absence of any threat.

In his 1972 paper he not only abandoned but reversed the traditional criteria for measuring the degree of competition in an industry. The traditional view is that competition increases with the number of firms in the market; Linda states that oligopoly is a necessary condition for many forms of competition. ("Atomistic market structure is not to the advantage of competition, nor of those engaged in economic activity nor of society. It benefits nobody; it is harmful to all," Ref. 37, p. 342.) The traditional view is that product differentiation represents a departure from competition; Linda sees it as a competitive strategy; heterogeneity of products is not an imperfection but a sign of competition (p. 328). The traditional view sees barriers to entry as a third dimension of restricted competition; Linda sees their existence as evidence of, and stimulus to competition. These differences from the traditional view may not be so fundamental as they appear (see p. 60 below) but they do mean that a new definition of monopoly or of absence of competition is required.

The deployment of oligopolistic strategies will benefit the consumer only if they do not lead ultimately to rigidity. There is probably an optimal structure in each industry within which competition will be greatest. When the structure becomes too concentrated or too atomistic, there is a danger of reduced competition and rigidity. "Monopoly" (that is the absence of competition) may be recognised, according to Linda by absence of change in the market structure (Ref. 37, p. 341-2). His system of indices relates to this novel perspective of monopoly and competition.

In designing a statistical description of oligopoly Linda emphasises three features: interdependence, inequality and dynamism. The first feature is partly determined by the number of large firms; the second

depends on their relative sizes and embraces the concept of dominance; the third relates to changes in the first two features. Dynamism appears to reflect the degree of competition, although the three features are interrelated - some structures lend themselves to dynamism more than others.

2. Some Comments on Linda's Approach to Oligopoly

It has already been pointed out that seller "concentration" is commonly used to describe two different features of market structure - the number of firms and the degree of inequality between them. Let us compare two different hypothetical industrial structures: (A and B): both have the same barriers to entry and in neither is there significant product differentiation. In industry A there are 40 firms of equal size and in industry B four, also of equal size. How is competition likely to vary between these industries?

The principal difference between A and B is the greater degree of interdependence in B. The consequences of this and the associated theories of oligopolistic behaviour have been widely discussed (Pickering, Ref. 9, Chapter 14 provides a comprehensive survey of the discussion). Before taking any action which might affect its market share, a firm in B must consider the reaction of its competitors. If it took action which would increase its share of the market by half, from 25 to 37.5 per cent, then its competitors must lose on average one-sixth of their market share - from 25 to 20.83 per cent. If all four firms are of equal size and equal resources and all have excess capacity then such action by any single firm is unlikely. If it were to occur then competitors could well follow suit, market shares would be the same as before but all would be incurring the costs of the strategy adopted by the initiator.

This reasoning is best known in the form of the kinked demand curve hypothesis, used to explain absence of price competition under oligopoly. The equilibrium of the kinked demand model is an unstable one with respect to downward price changes under conditions of excess capacity. Once price wars begin they can be difficult to terminate without a formal agreement which, with anti-cartel legislation and more public vigilance about price agreements, may be hard to enforce. A good example of this is currently observed in the retail petrol market. Because this danger is obvious, a firm is likely to initiate price-cutting only if it believes that it has some advantage over its competitors - in costs, available capacity or long-term resources.

Although the kinked demand curve is usually applied to price an analogous relationship can be applied to any other competitive strategy. Expenditure on advertising or sales promotion, introduction of improvements in product design or quality, vertical integration via acquisition of outlets or supplies - each of these is subject to the kind of relationship represented by the kinked demand curve.

The tyres report (Ref. 3) illustrates some aspects of this, though the example is not archetypical because the firms are not equal. Advertising of tyres by all companies fell sharply between 1973 and 1974, but Dunlop more than doubled its advertising expenditure in 1975. This

was followed (Ref. 3, p. 34) by an increase on the part of all but one competitor; the exception was a firm in apparent financial difficulties. Again in tyres, there is no doubt that the consumer has gained from the product improvements of recent years, including much greater length of life. This has undoubtedly been stimulated by oligopolistic competition; in the report on tyres (Ref. 3, p. 33) attention is drawn to the call by one of the largest firms for curtailment of research into longer tyre life. This plea for an armistice in the product-improvement war is equivalent to a plea for no further movement down the kinked demand curve.

There is a close link between the kinked demand hypothesis and Linda's analytical framework, which takes into account interdependence, inequality and dynamism. The greater the degree of interdependence, then the greater will be the pressure on other firms to follow a competitive action adopted by any of the oligopolists; the greater therefore will be the degree of deterrence against competitive actions. Let us consider an industry with a captive total market and virtually prohibitive barriers to entry. If (i) each of the very small number of firms is absolutely equal in every respect - shares in this particular market, total size and resources, profitability, access to customers, access to equally good advice on product design, production and distribution technology and marketing and (ii) each pursues the same objective or set of objectives, then one would expect competitive action to diminish towards zero as the number of competitors approached two. Even in the absence of collusion, which is itself facilitated and stimulated by the existence of fewer firms, one would expect rigidity. "The inequality of the firms and the diversity of their motives, their environment and their level of information ... (inter-alia) ... are the most powerful stimulant of competition." (Linda, Ref. 37, p. 328).

Few students of oligopoly would disagree that the nature and intensity of competition between the firms is influenced by their number (and therefore interdependence) and relative strengths. However, all firms do not have the same objectives. Although different industrial structures imply, with assumptions of profit or sales-maximisation, greater likelihood of particular forms of competition, actual behaviour in the market depends upon human decisions. These may not be consistent with objectives presumed by external observers.

One controversial aspect of Linda's analysis of oligopolistic structure is the minor role he assigns to the smaller firms which form the "fringes" of an industry. He appears to view them as existing only on the sufferance of the large enterprises who, besides having recourse to acquisition or merger, can often control small firms by the effective use of sub-contracting, (Ref. 37, p. 353). Utton (Ref. 38, p. 70) is among those who see small firms as having a disproportionate influence on the character of competition in oligopolistic industries. The retreading companies in the tyre industry (Ref. 3, p. 29-31) appear to confirm Linda's view but the low-price battery producers continue to compete with and influence the policies of the largest firms (Ref. 3, pp.90 and 97). Unlike batteries, tyres are seen as a "concern" product and product differentiation by the large firms is more effective.

Although the relationship may not be as close as he appears to suggest, Linda might find widespread agreement that interdependence of and inequality between firms are the major influences on competitive behaviour in an oligopoly. The notion that the degree of competitive behaviour can be measured by changes in structure is open to doubt. Such changes can be taken as a priori evidence that competition has taken place but near-rigidity does not imply absence of competition; it may reflect mutually offsetting competitive strategies. Even a prolonged price war could leave market shares little changed if reaction by competitors were sufficiently fast. The changes in shares of the U.K. replacement tyre market have been gradual (Ref. 3, p. 37) but there has been no absence of competition. Heavy advertising by manufacturers and their distributive subsidiaries, price cutting at the retail level, competitive product improvement - all contributed to intense competition. Market shares changed only slightly because these competitive actions were pursued by all the major firms and compensated for each other.

There are two other aspects of oligopolistic behaviour which Linda referred to in his 1972 paper (Ref. 37, Part III) as important for society but which are not reflected in measures of interdependence, inequality and dynamism. The first concerns the form of competition. Whereas society may benefit from certain forms of oligopolistic competition such as genuine product improvements or better distribution, there may be a net loss from waste of resources on minor product embellishments or heavy mutually-compensating sales promotion. Provision of information about the forms of competition does not form a major part of the statistical investigations required for Commission's concentration studies. Although the terms of reference for each study refer to the forms of competition, this aspect is not discussed in detail in the Commission's published methodology (Ref. 39).

The second aspect, not necessarily covered by analysis of interdependence, inequaltiy and dynamism in oligopoly is degree of collusion. This may be effected not through agreements but through common decisions to use the same signals for changes in policy. The most easily recognised example is price leadership, which usually occurs where firms are unequal in size. The leadership of Dunlop still exists in principle in the tyre industry but abolition of resale price maintenance and widespread discounts make this difficult to detect. Barometric pricing, where some external factor is used as a signal, is found in certain industries. Interdependence, particularly when the combined market is fairly captive, implies likelihood of collusion but search for evidence of collusion as such receives comparatively little emphasis in the Commission's recommended methodology.

How far apart are Linda's approach to the analysis of monopoly and competition and the more traditional approach described in Section B? The differences clearly necessitate his new definition of absence of competition ("monopoly") but do not represent a complete break with previous thinking. The argument concerning the relevance of perfect competition to analysis of a world in which oligopoly predominates is familiar. As long ago as 1947 K. W. Rothschild wrote that attempts to analyse oligopoly "have been hampered by being too much influenced by the models of perfect and monopolistic competition and pure monopoly.

Yet neither of these theories can be expected to form a sound basis for the study of duopoly and oligopoly prices." (Ref. 40, p. 24)

Rothschild went on to recommend that a new methodological framework for analysis of oligopoly based on analogy with military warfare. He quoted a number of other authors with the same view. Numerous writers have urged the application to oligopolistic behaviour the analysis of military strategy, of games theory and the psychology of conflict. These concepts are not far removed from Linda's use of wrestling terminology, following the analogy used by F. Perroux (Ref. 41).

The argument that an atomistic industrial structure would not be ideal even if it were possible has also been frequently advanced. For many years, economics students have read Schumpeter's view that the existence of oligopoly and even short-term monopoly not only leads to economies of scale but also encourages technical progress and expansion (Ref. 42, pp. 40-66). Commenting on this view in 1969 Hunter (Ref. 43, p. 69) stated: "Economists are properly appreciative of economies of scale and the importance of adequate finance for technological research and economic innovation but they are equally aware of the dangers of foreclosure of entry into an industry, and of arbitrary pricing, the empire-building propensities of businessmen and the risk of *simple stagnation where no competition is there to stimulate.*"

The words in italics show close affinity to Linda's concept of dynamism: within oligopoly there is a danger of rigidity. The policies pursued by firms to try to establish a protected position form part of the competitive process. Attempts at product differentiation can lead to competitive quality improvements; certain actions to prevent entry can similarly benefit the consumer in the short term and can stimulate search for substitutes and product development. However, if such policies are effective in creation of long-term protection than competition will disappear, technical progress may be retarded and prices may be higher than under more competitive conditions. Linda's concept of dynamism brings his approach closer to that of the more traditional micro-economist.

For the purpose of analysing oligopoly industries, Linda's approach is seen by some as more relevant than those which start from the premiss of perfect competition. (See for example Morvan in Ref. 44, p. 188-192 and de Bandt in Ref. 45, p. 44-46). In my view it represents a step forward from the conceptually ill-founded and rather sterile studies of the relationship between concentration and profits described in the previous section. It may be viewed as an attempt to bring into the study of concentration some of the concepts of those who find the traditional continuum from perfect competition to monopoly (a continuum with several dimensions) irrelevant to analysis of oligopoly. However, as I have attempted to show, indices of interdependence, inequality and dynamism may be insufficient to describe behaviour in an oligopolistic industry. Not all of the aspects of oligopoly which demand the attention of bodies like the Commission's Directorate General for Competition will be revealed by summary statistical indices. We shall return

to the indices and their limitations in Chapter Four. Here, it is important to emphasise the dangers of trying to summarise complex industrial structure and behaviour in one or two statistical measures. In heading for such dangers, designers of new indices are following a well-trodden path.

D. AGGREGATE CONCENTRATION - DOES IT RECEIVE SUFFICIENT ATTENTION?

Before leaving the wider issues surrounding concentration studies, we should recognise that, in adopting a "sectoral" approach to concentration the Commission is reducing the emphasis on aggregate concentration - the increasing share of total economic activity accounted for by a limited number of conglomerate groups. In his 1972 article (Ref. 37), Linda referred frequently to the importance of these large diversified often multinational groups whose power in society threatens to outstrip that of governments. Emphasis on studies in individual industries means that this wider "aspect" receives less attention.

One reason for this may be a shortage of aggregated statistical data in other E.E.C. countries. One of the papers prepared for the 1967 committee of experts, by Phlips (Ref. 19) was devoted to problems of quantifying aggregate concentration. In the United Kingdom, data are available and they reveal increasing aggregate concentration over time. Recent work by Prais, (Ref. 46), based on Censuses of Production showed that the share of total net output in manufacturing accounted for by the 100 largest companies rose from 22 per cent in 1949 to 41 per cent in 1968 (a later figure for 1970 is not strictly comparable). Further analysis of the 1968 Census data reveals that the 38 largest firms, with over 20,000 employees accounted for nearly 29 per cent of all value added in manufacturing in this country. These 38 include some of the largest companies in the industries covered by the Cranfield studies for the E.E.C. and also the parents of some of the smaller units.

Diversification tends to cut across market structure. Concentration ratios or indices of inequality based on single-industry figures no longer reflect concentration or inequality of strength. Diversified companies can adopt competitive strategies based on the possibility of cross-subsidisation. Empirical studies show, not surprisingly, that profits are stabilised by diversification and some studies also show that the average level of profits is increased - for example Morvan (Ref. 44), R. A. Miller (Ref. 47). In his April 1972 paper (Ref. 35) George outlined the substantial effects of diversification on power over the market and warned of the dangers of insufficient attention on the part of anti-trust authorities to the formation of conglomerates.

Our own studies suggest that the conglomerate enterprise may occasionally find its facility for cross-subsidisation a disadvantage. In textiles and in publishing, the availability of funds from other sources has prevented the implementation of labour-saving measures. Yet on balance the very large firm with activities in many industries must have advantages over its more specialist competitors in each.

Aggregate concentration is also of great interest to political economists. The greater the degree of overall concentration, the fewer the individuals with which governments have to treat in order to exercise economic policy. Conformity may be easier to enforce until the enterprises become so large and their international activities spread so widely that governments can no longer control them.

Without evaluation of aggregate concentration, the Commission can obtain neither a complete understanding of competitive strengths in individual industries nor a comprehensive picutre of the economic power of major international groups within the Community.

E.. SUMMARY AND CONCLUSIONS

The Commission's interest in concentration is derived from its responsibility to identify and check the abuses of dominant positions by undertakings within the Common Market, in so far as these affect trade between member countries. The major purpose of the series of concentration studies is the collection and analysis of facts.

Concentration is only one aspect of dominance or power over a market; other elements include product differentiation, barriers to entry of new competitors and collusion between firms. These elements are closely interrelated and it is impossible to combine them in a single measure. Attempts to measure dominance by reference to monopoly profits are unsatisfactory, because the effects of dominance may be reflected in profits only to a slight degree.

Econometric investigations into the relationship between concentration or size and profitability have been numerous. Their value is reduced by problems of data consistency and doubt about the validity of the statistical methods applied. The weak statistical conclusions of most of these models may be attributed to the unreal nature of the hypothesis which they have tested. Concentration may be an important component of dominance but the gains from dominance may be absorbed in higher labour costs, greater discretionary expenditure by management or by inefficiency and "slack."

A major part of the methodology prescribed by the Commission represents a break from the traditional view of market imperfections. The new indices introduced by Dr. Linda, the director of the Commission's research into market structures, are designed for analysis of oligopoly. They measure interdependence, inequality and dynamism. Monopoly power or dominance is defined by rigidity of the oligopolistic structure. In rejecting the view that monopoly power should not be measured in terms of departure from the atomistic structure of perfect competition, Linda is following a fairly well-trodden route. His measures of interdependence, inequality and dynamism cannot reflect the full range of oligopolistic behaviour. Excessive reliance upon them might leave the Commission unaware of certain aspects of that behaviour which might be against public interest.

Because of the decision to collect and analyse data on a "sectoral" or industry-by-industry basis, the methodology of the Commissions pays

insufficient attention to aggregate concentration and the power of large conglomerate undertakings. Their size and diversity of interests enhances their competitive strength compared with that of specialist producers in any single industry. Aggregate concentration is also of macroeconomic interest: it may increase a government's ability to intervene but when international companies become very important in any single country, the government of that country may find it much harder to control the economy.

The relationship between concentration and abuse of dominance is not simple. Its existence cannot be disproved by the econometric work which has adopted naive hypotheses and tested them with inadequate single-equation regression models. Analysis of concentration and identification of possible areas of dominance remains a logical first step in a search for abuses of monopoly power by a body with responsibility to find and check such abuses. It is important that sectors, variables, and "firms" should be appropriately and consistently defined. The measures of concentration should also be appropriate for identification of industries or markets where abuse of dominance is most likely to be found.

CHAPTER TWO: DEFINITION OF SECTORS; UNITS AND VARIANCES

A. DEFINITION OF SECTORS: CONCENTRATION WITHIN WHAT?

1. Theoretical Background

For concentration measures to have any meaning it is important to define appropriately the sector of economic activity in which the degree of concentration is examined. The basis of definition should vary according to the purposes of the research. For example if one were interested in concentration among employers of a particular type of labour or among purchasers of a raw material then the sector would be best defined according to technical or physical criteria. Where the interest is in market dominance, the appropriate criterion is partly related to the end-use of the product. The appropriateness of various classification criteria for different research purposes was discussed by de Bandt (Ref. 45 , pp. 16-20). He concluded that for determination of market power the basis of classification should be homogeneity of product, "considered as a means of satisfying needs." Holtermann wrote "in theoretical terms an industry is a group of firms producing a single commodity or ones that are close substitutes in consumption." (Ref. 26 , p. 122).

The definition of an industry in terms of cross-elasticities of demand has a long history. Some theorists such as Triffin (Ref. 14) have questioned the concept of industry because every product is to some extent competing with every other for the consumer's expenditure and the degree of substitutability is a matter of degree, measured by a panopoly of cross-elasticities of demand. Others have argued that an industry might be defined in terms of discontinuities in cross-elasticity relationships - products of the industry should be much closer substitutes for each other than for any products outside the industry. The view that commonsense will enable us to define a market in these terms was implied by Adelman (Ref. 48) who deplored the "fatuous over-elaboration" of the market concept.

A paper presented to the 1977 Bruges seminar on E.E.C. competition policy by de Jong (Ref. 49) questioned the cross-elasticity of demand criterion for definition of the sector in which concentration is examined. He raised a question of principle, in addition to the usual objection about the practical impossibility of measurement. In definition of an industry as firms in competition with each other, we should consider cross-elasticity not only of demand but also of supply.

De Jong's argument is illustrated by a continuation of the above quotation from Holtermann (Ref. 26, p. 122): "A very broadly defined industry like textiles will include many commodities not substitutable at all. For this reason the results of testing the hypotheses (about concentration and profits) at this level of aggregation would be expected to be weak." The general principle of Holtermann's argument is widely recognised and supports the comments in the first of the Cranfield reports for the E.E.C. (Ref. 1, p. 3). The example, textiles, is inappropriate. A textile firm can use the same machinery and skills to make products to meet a wide range of end-uses. In this

industry it is more meaningful to group products by homogeneity of manufacturing methods than of end-use. This means that divisions within textiles are important but they are based on supply flexibility - not on proximity of end-uses. Even so the cross-elasticity of demand remains highly relevant to the study of individual markets - the demand for textile handkerchiefs, and towels is related to that for paper substitutes.

2. The Practice Adopted by the Commission

Like most other studies of concentration the sectors chosen by the Commission are generally defined by the equivalent of the British and U.S. Standard Industrial Classification - the Nomenclature Industrielle de la Communauté Européene (NICE), which was recently replaced by the Nomenclature d'Activités dans la Communauté Européene (NACE).

The first of the Cranfield studies covered NICE categories 271 and 272 exactly equivalent to Minimum List Headings 481 to 484 of the Standard Industrial Classification, covering the manufacture and conversion of paper and board. The second study covered the spinning and weaving of wool (NICE 232, SIC 414); spinning and weaving of cotton and of man-made fibres on the cotton system (NICE 232, SIC 412 and 413 except that the SIC classes also include linen) and hosiery and knitted goods (NICE 233, SIC 417). The fourth of our studies covered the press and other publishing (SIC 485, 486 and part of 489). Both the NICE and the Standard Industrial Classification are based essentially on production rather than end-use characteristics.

It may be observed that the third of our studies was not related to an industrial sector as defined by NICE. Three individual products were chosen - tyres, sparking plugs and accumulators for motor vehicles. This was because of a particular interest on the part of specialists within the Commission in these product markets.

The problems of aggregation are of course recognised by the Commission. In his 1972 article Linda defined a market as being "constituted by a group of relatively distinct products which are suitable for more or less the same basic uses." (Ref. 37, p. 339). The prescribed Methodology of Concentration Analysis published in 1976 (Ref. 39, p. 77) repeats the emphasis of earlier documents on the need to supplement industry studies with analysis of markets within them. The requirement to measure and study the consequences of concentration at the industry level is derived partly from an absence of data from any source about product markets, especially in the case of financial variables (ibid, p. 78). Another reason is that concentration relates to undertakings and the industry represents the common enviroment in which similar undertakings operate. Concentration analysis must approach the causes and effects of concentration; analysis at the industry level is essential to this (ibid, p. 96).

Some doubt must surround the view that an industry represents a common environment because some quite large firms do not compete with each other to any significant degree but happen to be classified to the same industry. For example the Tilling subsidiary, Pretty Polly, derives most of its turnover from sale of women's nylon tights. It is included

in the textile sample but in no sense can be seen as a competitor of Dunlop Textiles which produces a large volume of tyre fabrics, or of some of the large Yorkshire worsted producers. In the publishing industry, as I pointed out in our fourth report (Ref. 4, p. 18) only four of the 61 largest firms had significant sales of both books and newspapers and within these four firms the activities were undertaken by completely separate subsidiaries. In these cases, cross-elasticities of supply are also very low: the required technology and expertise are completely different.

Although one may thus criticise the resort to conventional industrial classifications for the study of concentration, in practice the use of these classifications in published background data dictates this policy. In most cases they contain undertakings with recognisable affinities - either via demand or supply factors. The Commission have throughout the Cranfield studies insisted on the study of product markets as well as analysis of industry figures. It is important to remember the basis of classification when interpreting concentration ratios but otherwise the three-digit industrial classification is probably the best available system for studies of this kind.

3. The effect of narrower definition on concentration and its significance

One of the best recent expositions of this topic is that by de Bandt, which unfortunately lies hidden in a French pamphlet unavailable in this country (Ref. 45, pp. 14-23).* De Bandt stated that *a priori* the degree of concentration increases with the degree of homogeneity imposed for purposes of definition but at the same time the significance of the concentration for power over the market diminishes, because substitution from outside the group increases. The increased degree of homogeneity also reduces the size of the sample of firms and may make it more difficult to derive statistically meaningful results.

De Bandt went on to show through hypothetical examples that the degree of concentration can be greater in the total sector than in the sub-sectors. From an unpublished paper of 1950 entitled "Is concentration greater the finer the product classification?" de Bandt quoted Herfindahl as stating "The common assertion that concentration is greater for separate products must be true only if reversals are sufficiently numerous." (Ref. 45, p. 22).**

From further quotations by de Bandt it is possible to obtain a definition of "reversal" which is perhaps best explained symbolically:

Let x_i and x_j = value of sales of product X by firms i and j
y_i and y_j = value of sales of product Y by firms i and j

Reversal means that $x_i > x_j$ but $y_i < y_j$.

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* A copy was borrowed from Nanterre and a photocopy can be supplied to the examiners.

** Words are my translation from de Bandt, not necessarily Herfindahl's own English original.

If $(x_i - x_j) > (y_j - y_i)$ but $< 2(y_j - y_i)$ then

$$\frac{x_i}{x_i + x_j} > \frac{y_j}{y_i + y_j} > \frac{x_i + y_i}{x_i + x_j + y_i + y_j}$$

The industries which were the subject of our own investigations may be used to illustrate the effects of narrowing of the base for concentration measurement.

(a) Paper

Although this study included a detailed analysis of product groups, certain of the criteria used for classification now appear to have been unsatisfactory. (This is discussed on p. 31 below). More meaningful information (though not conveniently presented) can be obtained from the 1968 Census of Production.

In the manufacture of paper and board the eight largest enterprises accounted for 53.6 per cent of employment (and presumably a similar proportion of sales turnover). The five-firm concentration ratios for four different categories of paper were all higher than this.

For converted paper products, five-firm sales-concentration ratios varied from 89.7 per cent in the case of wallpaper to 38.7 per cent for cardboard boxes and only 32.2 per cent for manufactured stationery. On the evidence of our own figures (Ref. 2) it would appear that the five-firm concentration ratio for paper conversion was between 50 and 60 per cent.

(b) Textiles

By combining the results of our textile study with Census data, it is possible to show four-firm concentration ratios in the three sub-sectors investigated and in the combination of the three. In this industry, the importance of the large oligopolists with interests throughout textiles is evident in the combined figure, although it is partly understated by the exclusion from our survey of man-made fibre production (ICI and Courtaulds) and the fact that concentration ratios do not reflect minority shareholdings between firms (p. 34-5 below).

Table II-1 Four-firm Concentration Ratios in Textiles 1968 and 1973

% of all sales revenue as reported by Business Statistics Office

	1968	1973
Woollen and worsted	20	27
Cotton etc. spinning and weaving	41	47
Hosiery and knitwear	42	47
Three sub-sectors combined	34	41

Sources: Ref. 50, Tables 14 and 21

In the textiles case it should be noted that the sub-sectors as defined by the British Standard Industrial Classification and the Nomenclature Industrielle de la Communauté Européene both follow a historical distinction between cotton and wool which has now become arbitrary. In Table 6 of the textile report (Ref. 2) it is shown that in 1968 over 54 per cent of fibre used in the U.K. textile industry was man-made and by 1973 this proportion had risen to 70 per cent. The traditional boundaries between cotton and wool remain but the distinction has become more one of geography and conventional trading affinity rather than production methods or differentiation of end-use of product.

(c) Publishing

This is another sector in which breakdown into more narrowly defined product markets does not consistently increase the degree of concentration. Only four companies have significant interests in both the Press and the publishing of books. Three of these four are the largest three companies in the industry. For this reason the four-firm concentration ratio in 1975 was higher for publishing as a whole than for the Press. At lower levels of aggregation the degree of concentration changes again. The figures in Table III-2 are again based on combination of our data for individual firms with aggregate information published for each sub-sector.

Table II-2 Four-firm concentration ratios 1975

	Variable	%
ALL PUBLISHING	Sales revenue, inc. advertising	48
PRESS	Sales revenue, inc. advertising	45
PERIODICAL SALES	Retail sales value	53
NEWSPAPERS (U.K.) total	Total copies sold per week	60
Regional circulation		
London and S.E.	Total copies sold per week	67
Wales and S.W.	Total copies sold per week	70
Midlands	Total copies sold per week	68
North-West	Total copies sold per week	58
North and N.E.	Total copies sold per week	60
Scotland	Total copies sold per week	69
SCHOOL TEXTBOOKS (1976-7)	Retail sales value	46 (based on direct survey)

The results of our own studies show that although more narrow definition does tend to increase concentration, the existence of large groups with

interests in most sections of an industry can result in exceptions to this general tendency.

4. The importance of foreign trade

Most of the statistically significant measures of the influence of concentration have been derived from United States studies (see Chapter One). Researchers into this subject in the United Kingdom e.g., Holtermann (Ref. 26, p. 137) have pointed out that, because concentration ratios derived from sales turnover of domestic firms ignore imports, correlation with economic performance is much less likely in a country with relatively important foreign trade. Hart and Morgan (Ref. 18) did not find that the ratio of imports to domestically produced sales significantly affected profitability when this was included in an equation with the concentration ratio as another independent variable. This finding which the authors do not explain but describe as "surprising" could be due to their use of a single regression equation. In any given situation of market demand, profits of domestic firms might be negatively correlated with imports. However, if some importers concentrate on those segments of the market where profits are to be earned, this will lead to a weakening of the negative correlation. In simpler terms, imports may depress profits but profits attract imports; the absence of correlation reflects these compensating influences.

The documentation supplied by the Commission to research institutes participating in this series of E.E.C. studies makes little reference to imports, though they are required to be included in the field-research projects now being undertaken in connection with product markets (Ref. 39, p. 78). A good deal of information about imports was included in our report on vehicle accessories and the concentration ratios relating to market share for sparking plugs and batteries included imports. This is exceptional: treatment of imports as though they were from one firm can clearly distort concentration indices when imports account for a substantial proportion of the market.

In two of the three complete industries studied, paper and textiles, foreign trade was so significant that proportions of U.K. industry turnover could not even approximately reflect market share. In 1972 only 250 billion tonnes of paper were exported (5.8 per cent of U.K. output) but 3050 billion tonnes were imported, equivalent to 43 per cent of U.K. paper consumption (Ref. 1, p. 29). Textiles and clothing combined have a comparatively small net trading deficit (Ref. 2, pp. 12-14) but exports and imports are large in relation to domestic production. Table 3 of the textiles report shows that 55 per cent of U.K. domestic purchases of woven cotton fabrics and 42 per cent of those woven from man-made fibres are imported; for made-up clothing the proportion is 20 per cent and for hosiery and knitwear 27 per cent. Because of imports at intermediate levels (e.g., of foreign yarn for U.K. knitting factories), a better indication of their significance may be given by the ratio of the weight of imported man-made fibre to that of all man-made fibre incorporated in textile products sold in this country. In 1974 this ratio was 52 per cent.

When imports reach this level of penetration, the interpretation of concentration ratios which ignore them is difficult. Such ratios may indicate relative power within the industry or sub-sector but how can they relate to dominance of the market? How can oligopolies of the kind formed in the textile industry, partly through the action of fibre producers eager to safeguard their markets, be compared with similar structures in industries where import penetration is low, as in the national Press? This is a basic defect in the definition of the sector in which concentration is examined. Concentration in the total supply of the products of an industry is much more difficult to measure than that of domestic production but is surely more pertinent to the identification of dominance, which must be the ultimate objective of these studies.

B. DEFINITION OF UNITS OF CONCENTRATION (ENTERPRISES)

1. The 1976 Guidelines of the Commission

Two of the most difficult problems encountered in the E.E.C. studies concerned the definition of an independent unit and the criteria for a firm's inclusion in an industry sample. Precise guidelines were not laid down by the Commission for the paper study and although greater guidance was given for the subsequent studies difficulties remain, apparently because British law relating to the disclosure of company information differs from that in certain older member countries of the E.E.C.

The guidelines were set out in 1976 in "Methodology of Concentration Analysis..." (Ref. 39, pp. 10-11).* Units are specified at three levels:-

(a) Group of enterprises:- "is an association of enterprises held together by legal and/or financial arrangements such as holding companies, cartels, consortia etc. The group may comprise more than one source of decision-making - particularly as regards policy on production, sales, profits etc. It can bring together certain aspects of financial management and taxation matters."

(b) The enterprise:- "is a legally-defined organisation which (a) has its own balance sheet, (b) is subject to a directing authority (which may be either a natural or a legal person) and (c) has been formed to carry on in one or more places one or more activities for the production of goods and services."

(c) The "kind-of-activity units (KAU)":- which we have called EAU** - "those enterprises or parts thereof (whether spatially separated

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* The quotations are taken from the official English language version.

** We used the French language documentation before the official English translation. We translated "Unité d'activité economique" as "economic activity unit." The official translation, though linguistically unpleasant, probably has more meaning.

or not) that carry on a single activity which is characterized by the nature of the goods and services produced or by the essential identity of the production process employed, this activity being defined in terms of a standard classification of activities."

There is a difficulty in the U.K. in distinguishing between (a) and (b). Where a company has a controlling (50% +) interest in another the accounts of the controlled subsidiary are usually consolidated into those of the parent, payment to minority interests being deducted from profit after tax. Sales turnover of the subsidiary, excluding sales to other companies owned by the parent, is included with that of the parent. Where ownership is less than 50% consolidation does not occur. Sales turnover is not aggregated. For all practical purposes it is impossible to combine data for groups of enterprises where these groups do not involve majority shareholdings.

The methodology of the Commission as set out in 1976 (Ref. 39) calls for "two distinct econometric calculations." The first is based on the enterprise and includes values of variables relating to all activities of the enterprises included in the sample. The criterion for inclusion is that at least 50 per cent of the total turnover of the enterprise must be derived from operations within the specified industry. The second is based on activity units and includes data on operations within the industry and within the country. Any enterprise with significant operations within the industry is included, even if its main activities lie outside. The distinction will be made clearer with the description of how the two sets of criteria affected the composition of our samples for the textiles and publishing studies.

2. The Paper Industry Study

Partly because of communication difficulties and partly because the Commission's methodology was still evolving, the first of our four studies conformed with neither the enterprise nor the activity unit approaches, as now defined. We were asked by the Commission to regard the enterprise as the unit which produces its own balance sheet. This meant that if a conglomerate company produced separate accounts for subsidiaries engaged in different activities, these accounts were used for data purposes. In some cases where this policy was not followed by the company then the smallest "enterprise" for which a balance sheet was produced might encompass a number of activities and if over 50 per cent of turnover was outside paper manufacture or conversion, the firm was omitted.

The procedure adopted for the paper industry study differed from that subsequently followed (in line with the methodology described above) in three ways:-

(a) Only the paper-making or paper-conversion activities of the large groups were included, although the approach was ostensibly at the enterprise level. Estimates were made for certain variables which were not broken down into different activities. Because of the use of subsidiary accounts some intra-group sales were inevitably double-counted although we tried to exclude these and were helped in this respect by some of the companies.

(b) Paper-making activities of some firms which did not publish subsidiary accounts were excluded completely from our analysis.

We were well aware of the defects in our sample and data construction (Ref. 1, pp. 7-10). Similar difficulties were met by some of the other researchers working for the Commission at that time. Development Analysts Ltd., (Evely, Hart, Prais et al) devoted three pages of their report on the Food Industry (Ref. 51, pp. 101-3) to difficulties in sample construction and possible distortions which resulted from *ad hoc* decisions. They used essentially an enterprise approach adhering to consolidated accounts but had to depart from this in the case of Unilever and admitted also that the 50 per cent rule led to some unfortunate exclusions.

3. The Application of the Guidelines to the Textiles Study

During the course of this work the guidelines described in sub-section 1 were made available. The statistical analysis was carried out at two levels - the enterprise, with data from consolidated accounts of ultimate holding companies and the economic activity unit with data on activities falling within each of the three sub-sectors:- spinning and weaving of cotton and of man-made fibres on the cotton system; woollen and worsted spinning and weaving; hosiery and knitwear. The principal source of data for the three sub-sectors combined was analyses included in the consolidated accounts; breakdown into individual sub-sectors was based partly on examination of subsidiaries and partly on detective work, by ourselves and previous researchers. Discussions within the industry in 1978 regarding the 1973 figures suggested that these were reasonably accurate.

The enterprise analysis did not include those firms whose world-wide activities in the three sub-sectors did not exceed 50 per cent of world-wide turnover in all activities. This led to one very large anomaly - the exclusion of Courtaulds Ltd., the biggest textile firm in Europe. Man-made fibre production fell outside the activities defined by the Commission, and the spinning, weaving, hosiery and knitting activities accounted consistently for just under 50 per cent of group turnover.

Another issue arose in the case of Carrington-Viyella Ltd. This company was formed through the action of Imperial Chemicals Industries Ltd., in 1970. ICI then owned 64 per cent of the equity of Carrington-Viyella, reduced to 49 per cent in 1977. Normally, Carrington-Viyella would be treated for accounting purposes as a subsidiary of ICI and, since textiles would be only a small part of ICI's total activities, neither Carrington-Viyella nor ICI would appear in the Enterprise analysis. There is an outstanding commitment on the part of ICI made to the Government at the time of the formation of Carrington-Viyella. This is an undertaking to reduce its holding in Carrington-Viyella to 35 per cent as soon as practicable and meanwhile to use voting power equivalent to only 35 per cent. For this reason Carrington-Viyella was included in the enterprise analysis.

The textiles example shows that the value of the tables of concentration based on enterprises can be substantially reduced by anomalies arising

from the 50% criterion. The activity unit data cover the sixty firms with the largest turnover of products within each of the three sub-sectors and, in the case of the three sub-sectors combined the sixty firms with the largest combined turnover. Analysis of these data is likely to be more meaningful.

4. The Application of Guidelines to the Publishing Study

The 1976 guidelines were again applied and a serious anomaly occurred which was similar to the exclusion of Courtaulds from the Enterprise analysis in the textile study. This was the need to exclude Reed International Ltd., on the grounds that publishing accounted for only 41 per cent of Reed turnover (Ref. 4, p. 22). Since Reed is the group with largest publishing sales in the U.K. this seriously reduces the value of the concentration tables.

The newspaper industry (and associated publishing interests) is generally very open about breakdown of sales turnover etc. - there are some well-known exceptions. This means that the activity unit data for this study are nearly all taken from published accounts.

5. The Report on Tyres

The principal distinction of this activity from those described above is the importance of overseas owned companies. I decided in this case, with the consent of the projects director in Brussels, to depart from the guidelines and to analyse concentration at two levels:- all activities in the U.K. (in practice tyres accounted for over 70 per cent of each company's turnover) and all activities world-wide.

6. Some Comments on the Enterprise and Activity-Unit Approaches

It is obvious from the textiles and publishing examples that the "activity-unit" approach yields more useful information about concentration of domestic output of the products of an industry. There are two disadvantages in this approach:-

(a) Although U.K. companies with diversity of activities are obliged to provide a breakdown by activity of sales turnover and trading profits, the published breakdown does not always correspond to categories of the Standard Industrial Classification (or NICE). In the case of large conglomerate enterprises it is usually impossible to obtain data on the application by industry of other variables - employment, wage-bill, equity capital or net assets. Indeed, any such breakdown might be artificial - it would require arbitrary allocation of totals relating to combined activities.

In the paper industry study, we attempted to do this by analysis of accounts of subsidiary companies but not all large groups consist of autonomous subsidiaries which publish their own accounts. Even when this practice is followed, technical questions arise: for example should a loan by a parent to a subsidiary be regarded as equity capital? If so, what about profits from a subsidiary which are held as retained earnings by the parent - do not these reserves also equate to equity capital associated with the individual activity?

In both the textiles and publishing studies, activity unit analysis was confined to sales turnover and net profits. When the particular products accounted for less than 100 per cent of sales turnover, the estimates for "activity units" (that is sales revenue and net profits derived from activities within the sector) were derived from the consolidated published accounts of the parent company or from information supplied to us by that company.

(b) One may argue that the comparative strengths of competing enterprises depend partly upon their overall financial resources. A large diversified company may be able to dominate in the long run a specialist concern with equal sales turnover in one industry. The enterprise approach is therefore highly relevant to the study of oligopolistic competition (Perroux's "wrestling match" - Ref. 41).

The principal weakness of the enterprise approach is the use of the criterion that at least 50 per cent of sales turnover in a selected year should be derived from the sector concerned. This criterion is unsatisfactory:- first because sales turnover is not the ideal variable for such a judgement, value added would be a better measure for such ratios if it were available. Secondly the distortions which can result from the exclusion of a very large company for which the ratio is slightly under 50 per cent and the inclusion of another with just over 50 per cent can be so great as to make resulting concentration measure practically meaningless. How can one use such a measure for textiles which excludes Courtaulds, or one for publishing which excludes Reed? We were not alone in finding such anomalies: the London Business School research team were obliged to omit I.B.M. from the enterprise tables of their office machinery study (Ref. 52, p. 20).

The principles of the enterprise analysis appear to require redefinition if destructive anomalies are to be avoided. My own view is that inclusion in the sample must be based on the absolute value of sales turnover - "a sample of the 60 largest enterprises in an industry" means to most people the 60 firms with the greatest combined sales of the industry's products. Financial variables like net assets, equity capital, group net cash flow would have to relate to the total activities of these firms but by inclusion of certain additional information the danger of false comparisons could be avoided. It is the desire of economic statisticians to simplify presentation to summary statistics which leads to excessively simple criteria like the "50 per cent of turnover" principle. The resulting statistical measures can be dangerously misleading.

7. Inter-company links

A problem which affects all concentration ratios is the existence of financial and other links between companies. The interpretation of the ratios in applied economics is usually based on the assumption that firms are independent, competing units. At what level of equity ownership does this assumption become invalid?

For the paper industry study a figure of 90 per cent was suggested by one of the Brussels coordinating staff. In that industry partly-owned subsidiaries were found to be very exceptional. In the one case where a company had a holding in a significant subsidiary which only just exceeded 50 per cent, we decided not to include the subsidiary as a separate firm. For the other three studies submitted with this report, a company was included in the sample (for either activity-unit or enterprise analysis) only if it was not ultimately controlled (by virtue of an absolute majority of voting equity) by another. When companies within the sample held majority holdings in other companies within the sector then consolidated accounts were used. When two companies within the industry were both owned by another firm with wider activities, data for the activity-unit analysis were taken from the published breakdown of operations in the accounts of the ultimate holding company. When the form of presentation of these data was inappropriate, advice was sought from the company and/or estimates were made on the evidence of the subsidiary company accounts. This last method was used only in a very few cases.

The problems created by minority holdings are more complex. Appendix E, sub-sections (4 to 5) of the textiles report (Ref. 2, pp. 179-183) lists minority holdings among some of the largest firms in the sector. Courtaulds and ICI each held 8 per cent of the equity of Tootal and each was represented on the Tootal board of directors until December 1974, when the Courtaulds representation appears to have ceased. By December 1974 Courtaulds held 29 per cent of the voting equity of Highams Ltd. (but see Ref. 2, p. 180 for details of subsequent government interventions); ICI held 20 per cent of the ordinary shares of Lister Bros: Illingworth Morris had substantial minority holdings in six other large woollen and worsted firms, as well as a 2 per cent holding in Tootal.

In the publishing industry the distortions due to minority holdings are more significant. Details are set out in the report (Ref. p. 75). They include substantial holdings by major companies in other important concerns - the S. Pearson company holds 28.5 per cent of the West Midland provincial newspapers group BPM Holdings Ltd. The Daily Mail indirectly holds 24 per cent of the main publishers of newspapers in Bristol and adjacent counties. The Economist Newspaper which is included in our press sample as an independent competitor, is 49.9 per cent owned by the Financial Times, a subsidiary of S. Pearson.

Financial ties, common directorates and family links are all listed in the reports and the staff in Brussels with responsibility for the studies ensure that such connections between firms are identified and listed. In interpretation of concentration ratios and financial performance analysis such links may be overlooked. Overall concentration may to some extent be understated and measures of inequality between enterprises may also be misleading - this is another (less important) example of the 50 per cent rule as described in sub-section 6. Certain of the financial statistics and concentration ratios prepared in accordance with the Brussels methodology may be distorted.

Distortion may arise because certain of the variables specified by the Commission and described in the next section cannot be added when there are financial ties between enterprises. This is best demonstrated by a numerical example. Suppose company A owns 40 per cent of the equity of company B. Assume company B has sales worth £1,000,000 and net profits of £100,000 and that £40,000 is paid to company A. This will be included in A's net profit before tax. If company A also has sales of £1,000,000 and net profits associated with those sales of £100,000 then the net profit before tax figure in its accounts will be £140,000. By adding profits together, we would double-count A's share of B's profit; by expressing profits as proportions of sales we would distort comparison between the performances of A and B.

The problem described in the last paragraph can of course be overcome - but not simply. If, for example, we compared net profits as proportions of net assets then the £100,000 and £140,000 figures would be appropriate. Besides net profits, double-counting of intra-sample minority interests affects some of the other variables included in the Commission's series of studies and described in the next section. These are cash flow (gross and net), equity capital and net assets.

In the four studies undertaken at Cranfield, intra-sample minority holdings were not so widespread as to substantially overstate the totals of the variables concerned. (If they did, the result would be to distort the concentration ratios.) There remains a danger of such distortion in the application of the Commission's existing methodology to other sectors.

C. DEFINITION OF THE VARIABLES - CONCENTRATION OF WHAT?

Throughout the literature survey in Chapter One and for most of this chapter "concentration" has been used synonymously with "seller concentration" to mean concentration of sales turnover or occasionally of sales volume. This usage is common practice but the E.E.C. studies examine concentration of ten or more variables.

1. The Recommendations of the Commission and Variables Used in Cranfield Reports

The Commission requests the application of concentration indices to as many as possible of the following variables:-

Code number used by Commission	Variable
01	Sales turnover
02	Employment
03	Total employee remuneration
04	Net profit before tax
05	Cash flow = Net profit + depreciation
06	Gross investment = Additions to fixed assets
07	Equity capital = Paid-up capital + reserves
08	Exports

(a) In the paper study, we were unable to include data for variables 02 and 03 (employment and employee remuneration) because of the use of accounts of subsidiary companies to construct the industry sample. (See section B.) We added to the Commission's list of variables net cash flow = net profit + depreciation - tax.

(b) In the textiles study we also excluded variables 02 and 03 from the enterprise analysis because the enterprise tables related to world-wide activities of multinational companies among the sample but data on employment and employee remuneration relate only to the United Kingdom. We included net cash flow and also introduced net assets (= total assets minus current liabilities) as an additional variable; this modification to the Commission's normal methodology was also introduced by Development Analysts Ltd., in their study of concentration in the food industry (Ref. 51). For "economic activity units" we were able to include only sales turnover and net profits because, as explained on p. 33 above, companies normally publish breakdown by divisions of activity only for these two variables.

(c) In the study of certain vehicle accessories financial data were available only for tyres. Only one of the major companies operating in the United Kingdom, Avon, derives more than 25 per cent of its total world-wide turnover from British sales. For this reason the analysis of concentration was carried out at two levels:-

(i) U.K. activities:- sales turnover, employment, wages bill, net profits and advertising expenditure.

(ii) World-wide activities of the six/seven companies:- sales turnover, net profits, cash flow, equity, net cash flow and net assets.

The introduction of advertising expenditure (details of which were compiled from MEAL surveys - Ref. 53) reflected the importance of this variable as an influence on market share in the replacement market for tyres. The reference to holding company accounts for the main financial variables was necessitated by differences in transfer pricing arrangements and methods of financing by each of the international companies.

For the other two vehicle accessories - sparking plugs and batteries we were able to use only estimated shares of market volume as a variable for the study of concentration.

(d) For the study of publishing we used more variables than in the earlier research. For the enterprise analysis we included all variables specified by the Commission plus net cash flow and net assets. The value of this analysis was much reduced by the exclusion of the Reed group, the largest publishing company, (see p. 33 above). In activity-unit analyses of the publishing sector as a whole and of the press we used turnover and net profits. For analysis of sales of periodicals and of school

textbooks retail value of sales was used as the variable. We also produced concentration tables based on circulation of newspapers, at national and regional level.

2. A criticism of the Commission's Choice of Variables

The variables included in the Commission's methodology or added after consultation with its representatives fall into three distinct groups: dimension, net results and discretionary expenditures.

(a) Dimension variables: sales turnover, employment, wages bill, equity capital, net assets, sales volume

(b) Net results: profits, cash flow, net cash flow

(c) Discretionary expenditure: gross investment, advertising.

The distinction between (a) and (c) is more practical than theoretical. The variables in (c) are likely to vary much more over time for any single firm. In any one year the degree of inequality in these variables is likely to be greater than in any of the dimension variables.

This is borne out by an examination of the Gini coefficient, which is essentially a measure of inequality (see p. 52 below), for gross investment in the four sets of enterprise tables for which it was computed (paper manufacture, paper conversion, textiles and publishing). In 22 cases out of 24 the Gini coefficient for gross investment exceeded that for sales turnover; the two exceptions were in paper 1968 and 1969 conversion and I have reason to doubt the validity of some of the data for those two years in that particular study.*

Comparison of concentration in discretionary expenditure with that in the size of companies is relevant to the study of the process of competition, because discretionary expenditure is part of that process. If some firms consistently devote higher proportions of sales turnover and net assets to investment and/or promotion then their market shares might be expected to increase. This process will not be identified by comparisons based on single years if the pattern of discretionary expenditure is highly variable over time. There may be a greater degree of concentration in investment or advertising than in any of the dimension variables simply because of their greater instability over time.

Another important problem affects comparisons of concentration in (a) and (b) variables, that is in size and performance. Such comparisons are one of the objectives of the EEC studies, for example see Linda's discussion in the 1976 Methodology document (Ref. 39, p. 45-6).

---

* The figures were collected by casual labour. They include a number of "estimates" for smaller firms - as usual in such cases the "reasonable" figures show too little variance.

Linda draws major conclusions from the observation that profits in most industries are more concentrated than sales turnover or equity.

It will now be shown that profits, defined as turnover minus costs, must generally be more concentrated than turnover and that occasional exceptions reported in the EEC concentration studies arise partly from the decision to treat losses as zero profits.

Let us define profit as Revenue (sales turnover) - Costs

$$\pi = R - C$$

Assume that revenue and costs have the same coefficient of variation, that is the ratio of the standard deviation (σ) to the mean (μ) is the same for both variables:-

$$\frac{\sigma_R}{\mu_R} = \frac{\sigma_C}{\mu_C} \text{ so that } \frac{\sigma_C}{\sigma_R} = \frac{\mu_C}{\mu_R} = k$$

It can be shown (Ref. 54, p. 180) that

(i) $$\sigma_{R-C}^2 = \sigma_R^2 + \sigma_C^2 - 2\rho\sigma_R\sigma_C$$

where ρ is the coefficient of simple correlation between R and C. Substituting $k\sigma_R$ for σ_C equation (i) becomes

(ii) $$\sigma_\pi^2 = \sigma_R^2 + (k\sigma_R)^2 - 2\rho\sigma_R(k\sigma_R)$$

$$= \sigma_R^2 (1 + k^2 - 2\rho k).$$

The coefficient of variation of profits $V\pi$ is defined in (iii).

(iii) $$V\pi = \frac{\sigma_\pi}{\mu_\pi} = \frac{\sigma_R\sqrt{1 + k^2 - 2\rho k}}{\mu_R - \mu_C} = \frac{\sigma_R\sqrt{1 + k^2 - 2\rho k}}{\mu_R(1 - k)}$$

If $\rho = 1$, that is if costs and revenue and perfectly linearly correlated then

$$\frac{\sigma_\pi}{\mu_\pi} = \frac{\sigma_R(1 - k)}{\mu_R(1 - k)} = \frac{\sigma_R}{\mu_R}$$

If $\rho<1$ then $$\frac{\sigma_\pi}{\mu_\pi} > \frac{\sigma_R}{\mu_R}$$

It is reasonable to assume that in many sub-sectors the revenue and costs of companies will have approximately the same coefficient of variation and, if so, this algebra proves that the coefficient of

variation for profits cannot be lower than that for turnover and, in the absence of perfect correlation, it must be higher.

Concentration ratios are closely correlated with the coefficient of variation (see Chapter Three) and this seems to suggest *a priori* that these ratios will be greater for profits than for turnover.

A simple numerical simulation shows this quite clearly. Columns 1 and 2 in Table II-3 represent revenue and costs of ten firms in Time period 1; columns 4 and 5 are derived by applying to columns 1 and 2 a percentage increase chosen at random (by a random number generator) from the range 0.1 to 9.9; columns 7 and 8 were similarly derived from columns 4 and 5.

Table II-3 Simulation to show concentration of turnover and profits

Period 1			Period 2			Period 3		
Revenue	Costs	Profits	Revenue	Costs	Profits	Revenue	Costs	Profit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
10000	9000	1000	10340	9864	476	10764	10614	150
9000	8100	900	9414	8270	1144	10064	8303	1761
8000	7200	800	8728	7646	1082	9025	7837	1188
7000	6300	700	7385	6344	1041	8094	6401	1693
6000	5400	600	6420	5546	874	6523	5995	528
5000	4500	500	5265	4689	576	5486	4853	633
4000	3600	400	4120	3942	178	4202	4309	-107
3000	2700	300	3168	2838	330	3254	2915	339
2000	1800	200	2028	1937	91	2152	2067	85
1000	900	100	1074	964	110	1170	971	199

The objective of this process is merely to generate some numbers such that the correlation between profits and turnover is close but not equal to unity, while not imposing any particular distribution on the data.

In period 1 costs for each firm are equal to 90 per cent of revenue:-
$C = 0.9R$ and $\rho_{RC} = 1$

$\mu_R = 5500$ $\mu_C = 4950$ $\mu_\pi = 550$

$\sigma_R = 2872.3$ $\sigma_C = 2585.05$ $\sigma_\pi = 287.23$

$$\frac{\sigma_R}{\mu_R} = \frac{\sigma_C}{\mu_C} = \frac{\sigma_\pi}{\mu_\pi} = 0.522$$

The four largest values of turnover represent 61.8 per cent of the total and the corresponding four-firm ratio for profits is also 61.8 per cent.

In period 2 the correlation between revenue and costs is no longer perfect, at 0.9959

$\mu_R = 5794.20$ $\mu_C = 5204.00$ $\mu_\pi = 590.20$

$\sigma_R = 3028.88$ $\sigma_C = 2731.35$ $\sigma_\pi = 395.30$

$\frac{\sigma_R}{\mu_R} = 0.5227$ $\frac{\sigma_C}{\mu_C} = 0.5249$ $\frac{\sigma_\pi}{\mu_\pi} = 0.6698$

It can be seen that comparatively small random disturbances in revenue and costs produce a much larger coefficient of variation in profits, while leaving those of revenue and costs virtually unchanged. The four-firm concentration ratios for revenue and profits are now respectively 61.9 and 70.2 per cent.

In period 3 the correlation between revenue and costs has fallen to 0.9842 and the random disturbances have been sufficient to produce a loss for one of the ten units.

$\mu_R = 6073.40$ $\mu_C = 5426.50$ $\mu_\pi = 646.90$

$\sigma_R = 3195.94$ $\sigma_C = 2851.15$ $\sigma_\pi = 637.80$

$\frac{\sigma_R}{\mu_R} = 0.5262$ $\frac{\sigma_C}{\mu_C} = 0.5254$ $\frac{\sigma_\pi}{\mu_\pi} = 0.9859$

The four-firm concentration ratios for revenue and profits are now respectively 62.5 and 81.5 per cent.

In the Commission's methodology concentration of profits refers to concentration of positive values only. The negative figure in period 3 would be ignored and the mean and standard deviation would be derived from the nine positive values. In this case the coefficient of variation $\left(\frac{\sigma_\pi}{\mu_\pi}\right)$ would be reduced to $\left(\frac{618}{730.7} = \right)$ 0.8458, the four-firm concentration ratio for profits would fall to 72.2 per cent. This exclusion of negative values is necessary for the computation of some of the indices described in Chapter Three; the interpretation of a concentration ratio exceeding 100 per cent would be difficult.

I think it is probably the non-negativity assumption which causes some of the exceptions to the rule that "concentration" of the performance variables must normally be greater than that of dimensions. In certain cases (e.g., in publishing in 1971 and 1972) the degree of dispersion in costs must have been much greater than that in revenue. Without

more detailed statistical analysis it is not possible to compare the indices for performance and dimension variables in the way that the Commission appears to approve.

3. The choice of a variable for measurement of dimension

Most previous analysis of concentration has been based on comparison of company dimensions. Among variables most often used are employment, to which the greatest volume of published information relates, capital employed, net output or value added and sales turnover.

Employment, and the occasional substitute wages-bill represent one part of inputs to a production process. The use of this variable as a proxy for size of firms' activities would be valid only if production functions were linear throughout the sector. This means that a firm with double the output of another would employ twice the number of workers and double the amount of all other factors of production, including capital. This assumption ignores variations in capital-intensity with volume of production and also ignores economies of scale. These points were made by de Bandt (Ref. 45, pp. 24-5) and the capital-labour substitution problem was also mentioned by Pickering (Ref. 9, p. 4).

Net assets or equity capital are unsatisfactory as measures of dimension for this same reason, quite apart from the practical problems of valuation. Ratios based on these variables tend to overstate concentration because larger firms tend to be more capital-intensive. In addition, larger firms may have purchased assets more recently so that these are relatively highly valued, in part because of general price inflation.

Sales turnover is the most widely used variable as an indicator of dimension. For assessment of "dominance" of a market, sales may well be the most relevant variable. The principal disadvantage to its use as a measure of size is distortion by differing degrees of vertical integration. Power in relation to competitors, to suppliers and to labour and capital markets is more accurately reflected in value added - sales minus purchases from other firms. Value added is equal to gross trading profits plus employee remuneration. The use of this variable in the EEC concentration analysis would avoid some of the double-counting which occurs with the sales variable.

The double-counting of sales turnover and consequent understatement of concentration ratios (because denominators are inflated) occurs when sales of intermediate products and final products are included, for separate firms, within an industry. For example in textiles many of the knitwear and weaving firms obtain yarn from spinning companies. Whereas the relative importance of Courtaulds can be represented by an inverted triangle - its share of yarn production is greater than that of weaving which in turn is greater than that of finishing, the structure of Tootal is the reverse. When sales turnover of firms like this is added together, double-counting is inevitable.

The use of value added overcomes this difficulty. Pickering describes it as preferable to sales turnover (ibid.) and de Bandt describes it

as "definitely the most valid indicator of size" (Ref. 45, p. 26). It has a drawback, mentioned by both authors, in that it includes "not only the value of resources employed but also the degree of success achieved in that employment" (Ref. 45, p. 27). In other words it includes profits. If we are interested in the relationship between profits and size then by using value added as a dimension, we would include profits on both sides of the equation.

In spite of this objection, value added appears to be the most appropriate variable for measurement of concentration. Estimates of this do not appear in U.K. company accounts and, except for companies with no overseas operations, it cannot satisfactorily be estimated by adding gross profits to wages bill, because published information on employment relates only to the United Kingdom. Linda has proposed that in future studies there should be an attempt to include value added as an additional variable (Ref. 39, p. 31); statistical problems may make this impossible for the United Kingdom.

D. A POST-SCRIPT TO CHAPTER TWO

In this chapter I have analysed at some length problems of definition - of sectors, units and variables. Such analysis is tedious - it is far removed from the potentially more exciting exercise of trying to discover consequences of concentration. Unfortunately some of the problems of definition are so great as to affect the validity of measurements of concentration. Some of the solutions adopted by the Commission, though perhaps necessary to by-pass an analytical impasse, can occasionally lead to distortions so serious that the resulting concentration statistics have little practical meaning. These tedious subjects demand more attention from economists if concentration is to assist the formulation of policies on monopolies, mergers and competition.

CHAPTER THREE: MEASURES OF CONCENTRATION RELATED TO THE TOTAL SECTOR

A. INTRODUCTION - THE TWO ELEMENTS OF CONCENTRATION

The most common measure of concentration in an industry or market is simply the proportion of the total value of sales, or other dimension variable which is accounted for by the k largest values. In the United States the Census of Manufacturers reports four-firm concentration ratios (k = 4), while in the United Kingdom Census of Production five-firm ratios (k = 5) have been reported since 1963.

The limitations of such a ratio (or percentage) are obvious: it tells you nothing about the distribution of values within the k firms nor about the number and size of other firms in the industry. Concentration ratios based in a single value for k can be misleading when two different structures are compared; this is shown in Table III-1:-

Table III-I Sensitivity of k-firm concentration ratios to choice of k

Structure A

k	Sales of firm k	C_k	Sales of firm k	C_k
1	300	30	240	24
2	250	55	220	46
3	100	65	200	66
4	80	73	180	84
5	75	80.5	60	90
6	70	87.5	50	95
7	65	94	30	98
8	60	100	20	100
TOTAL	1000		1000	

Fellner (Ref. 55, p.115) suggested that the best way to describe concentration in an industry was a composite summary based on simple concentration ratios. As an example he gave:- 20-3-52 (s), which indicates that "the largest firm has a share of 20%, that the total number of firms with a share of more than 10% is three, that the joint share of these three firms is 52% and that small firms account for more than 10% of the total". The obvious disadvantage of a descriptive composite of this kind is that it cannot be used in further statistical analysis: but no single statistical measure may provide a complete description of concentration.

There are two elements in business concentration which are reflected in varying degrees by the numerous index numbers which have been

proposed:- (a) the number of firms and (b) the inequality of their sizes. "Absolute" concentration measures, which include the simple concentration ratio are those which take into account the number of firms; "relative" measures are those which relate only to dispersion of size (Refs. 45 and 55).

Some writers, following R. A. Miller (Ref. 22) add a third dimension to concentration - described by Vanlommel, de Brabander and Liebaers (Ref. 53) as "coalition potential." This concerns the degree of inequality between the very largest firms and those which fall outside this group. The importance of a "power threshold" is recognised also in the methodology of Linda and will be discussed mainly in the next chapter. Most previous work on concentration indices has related to number of firms and inequality in the industry as a whole.

The distribution by size of companies within most industries has a large positive skew. A small number of firms are above the arithmetic mean size and the vast majority below. Recognition of this skewed distribution has led to a distinct split in the approach towards measurement of concentration.

Some authors have suggested that the skewness might be eliminated by transformation of the size-dimension into logarithms so that inequality may be described by the variance of size or measures related to it. This approach is most closely associated with Gibrat. (Ref. 58), Hart (Ref. 56 and 59), Prais (Ref. 56 and 46) and de Bandt (Ref. 45). It should be emphasised that all of these authors also stressed the need to examine separately the number of firms. For example Hart and Prais (Ref. 56, p. 152) stated: "It is difficult to see how any entirely satisfactory judgement on changes in monopolistic tendencies in an industry can be made without a knowledge of the changes in the number of firms engaged in that industry".

Other writers have suggested that the logarithmic transformation is inappropriate because it increases the relative importance of smaller firms. Adelman (Ref. 48), Blair (Ref. 59), Marfels (Ref. 61) and Linda (Ref. 39, p. 16) all argue that the study of concentration requires examination of the dominance of the few large firms. All are emphatic in support of the view that "it is the dominance of the few, quite apart from the number of sellers, which tends to influence the market". (Blair, Ref. 59; see also Ref. 60)

The indices prescribed by the Commission of the European Communities will be examined in relation to the two aspects of concentration - inequality of size and number of firms.*

* Before reading the detailed analysis which follows, those unfamiliar with the indices may find it useful to consult pages 12-23 of the report on the paper industry, where the principal indices are defined.

B. MEASURES RELATED ONLY TO INEQUALITY

1. The Coefficient of Variation

This is defined as $\sigma/\bar{X} = \frac{n}{\Sigma X}\sqrt{\frac{\Sigma(X - \bar{X})^2}{n}}$

The standard deviation (σ) simply reflects absolute differences from the mean (see footnote **).

The standard deviation can be used as a measure for comparison of the absolute inequality of two distributions of X and Y only when the distributions of the standardised deviates $\left(\frac{X-\bar{X}}{\sigma_x}\right)$ and $\left(\frac{Y-\bar{Y}}{\sigma_y}\right)$ are identical.

This would clearly be the case if both X and Y were normally distributed but this last assumption is not necessary for the comparison. For example:-

10 values of X: 22, 30, 36, 38, 39, 40, 42, 47, 52, 54

σ_x = 9.154 $\bar{X}$ = 40.0 V = 0.229

10 values of Y: 14, 30, 42, 46, 48, 50, 54, 64, 74, 78

σ_y = 18.308 $\bar{Y}$ = 50.0 V = 0.336

The values of Yi are such that $(Y_i - \bar{Y}) = 2(X_i - \bar{X})$ and this is reflected in the standard deviation.

The coefficient of variation (V) relates the inequality to the overall dimension of the distribution. Provided the standardised deviates are identically distributed, this coefficient provides an acceptable measure for comparison of relative inequality.

The preference of some authors for example Van Meerhaeghe (Ref. 62) for V^2 does not appear to be consistent with the numerical logic demonstrated above.

The condition that the standard deviates should be identically distributed is not usually fulfilled. One danger inherent in the use of the coefficient of variation for comparison is that two widely differing distributions may have a similar coefficient of variation:-

10 values of X: 22, 30, 36, 38, 39, 40, 42, 47, 52, 54

(as before) = 9.154 X = 40.0 V = 0.229

10 values of Y: 68, 69, 77, 73, 75, 76, 77, 78, 79, 134

= 18.308 Y = 80.0 V = 0.229

** In the explanatory text of the reports the denominator for calculation of the standard deviation is defined as (n-1), because sample data were being used to estimate the population. The Commission's own computer programme uses n and the statistical results in the reports follow this approximation.

A more common danger is that comparatively small percentage differences in the size of the largest firms can lead to substantial changes in V. In the last distribution (Y) the largest unit accounted for 16.75 per cent of the total. If this were increased to 19 per cent by the addition of 18 to that unit and the subtraction of 2 from each of the remaining nine, then the distribution would appear as follows:-

10 values of Y: 66, 67, 69, 71, 73, 74, 75, 76, 77, 152

(revised) σ_y = 24.261 $\bar{Y}$ = 80.0 V = 0.303

The coefficient of variation has increased by 32 per cent of its previous value although each of the nine other units has lost only 0.25 per cent of the total to the largest unit. This instability of the coefficient of variation is due to its derivation from absolute numbers. With positively skewed distributions small changes in relative sizes affecting the largest units will have a disproportionate effect on this coefficient.

2. Transformation to Logarithms, the Lognormal Distribution and the Lorenz Curve

Any positive skew must be substantially reduced - or even reversed - by any transformation of the variable (provided all values are positive) to logarithms. The reasoning behind the use of the logarithm of size in analysis of business concentration is much stronger than this. An a priori argument suggest that the distribution of the logarithms of size will tend towards normality.

This argument is based on the "law of proportionate growth", first formulated Gibrat (Ref. 58), quoted by Hart and Prais (Ref. 56), and more fully explained by Prais (Ref. 46).

Weiss (Ref. 63) summarised it as follows:-

If F_{it} = logarithm of variable for firm i at time-period t

then $E\ (F_{i,t+1} - F_{it})$ is unrelated to F_{it}

Randomly distributed changes in F_i over time will cause the distribution of F_i to tend to normality and its variance will be a sufficient measure of the inequality of the distribution.

In simpler terms, the law of proportionate growth requires percentage changes in size to be random and independent of size. Under such conditions the logarithms of sizes would become normally distributed.

This effect can easily be demonstrated by a numerical example. Suppose that over each time-period half the firms in any size

group remain unchanged in size, a quarter rose by the ratio $e^{0.1}$ (or just over 10 per cent) and the other quarter declined by $e^{0.1}$ (or just under 10 per cent). This process would be as follows:-

	Time 0	Time 1	Time 2	Time 3
$\underline{\text{Log}_e}$				
9.7				256
9.8			1024	1536
9.9		4096	4096	3840
10.0	16,384	8192	6144	5120
10.1		4096	4096	3840
10.2			1024	1536
10.3				256

After seven time periods this distribution becomes as shown in Table III-2.

Table III-2 Effect of Law of Proportionate Growth After Seven Periods

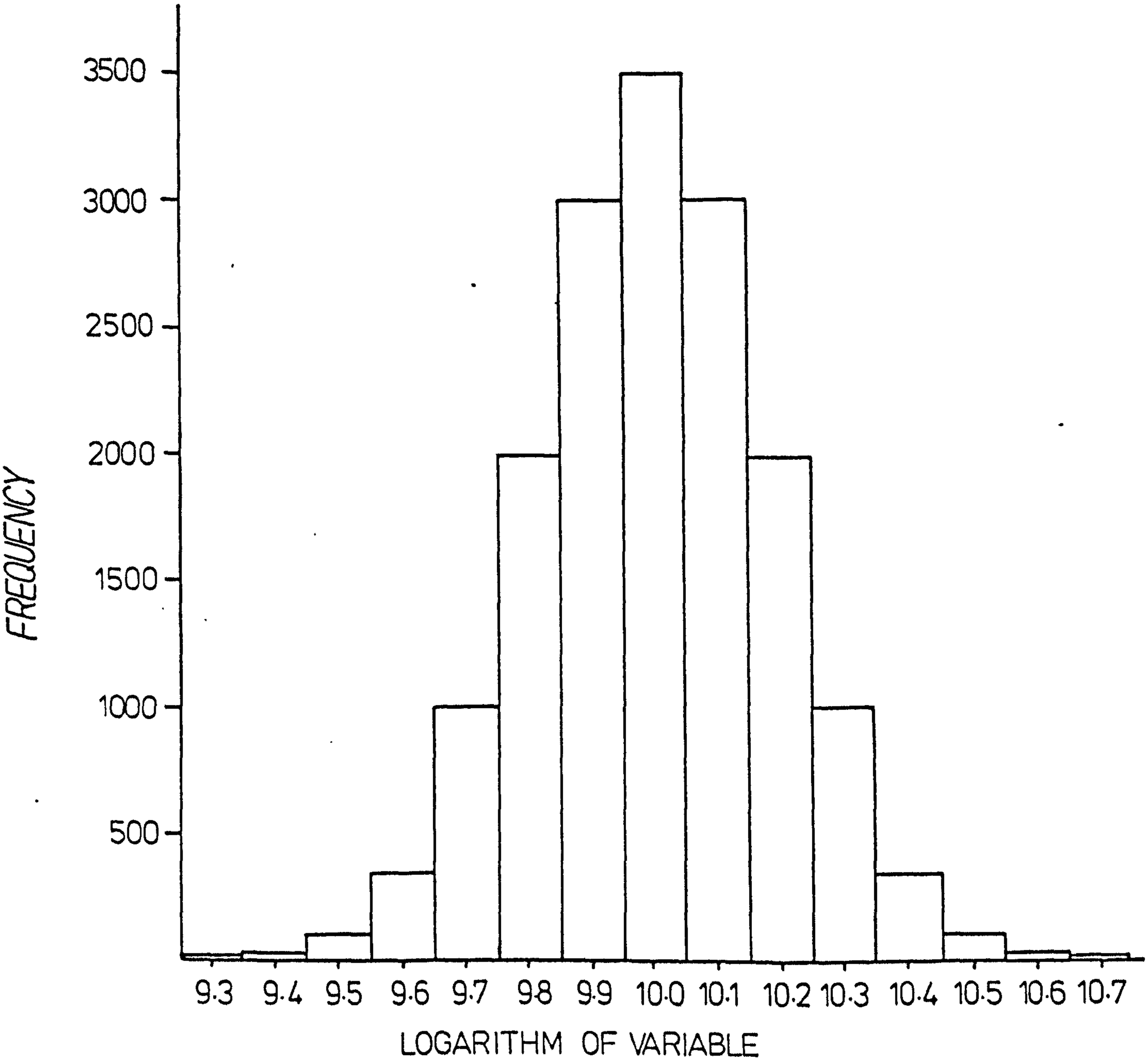
Log_e	No. of Units	Log_e	No. of Units
9.3	1	10.1	3003
9.4	14	10.2	2002
9.5	91	10.3	1001
9.6	364	10.4	364
9.7	1001	10.5	91
9.8	2002	10.6	14
9.9	3003	10.7	1
10.0	3432		

This distribution is shown in Figure III-1 and the emergence of a normal distribution is already apparent.

When the values of the variable are anti-logged and re-grouped the distribution is obviously skewed:-

Under 15,000	470	
15,000 - 20,000	6006	
20,000 - 25,000	6435	(Arithmetic mean based on ungrouped data = 22415)
25,000 - 30,000	3003	
Over 30,000	470	

FIGURE III-1 LAW OF PROPORTIONATE EFFECT AFTER SEVEN TIME PERIODS



THIS DIAGRAM DEPICTS THE DISTRIBUTION IN TABLE III-2

If the distribution of company sizes were lognormally distributed this would have important consequences:-

(a) Many of the indices of concentration would be mathematically related to the standard deviation of the logarithms. These include the coefficient of variation, the Gini coefficient, the Herfindahl-Hirschmanindex and the Entropy measure.

The formulae set out on pages 21-22 of the report on the paper industry are based on work by Aitchinson and Brown (Ref. 64) and unpublished work by J.C. Hull of the Cranfield School of Management.

(b) There would be a symmetrical Lorenz curve. The Lorenz curve was named after its originator who applied the concept to the distribution of wealth in 1905 (Ref. 65).

It shows on the horizontal axis the cumulative proportion of the total number of units and on the vertical axis the corresponding cumulative proportion of the total of the variable when the units are arranged in ascending order.

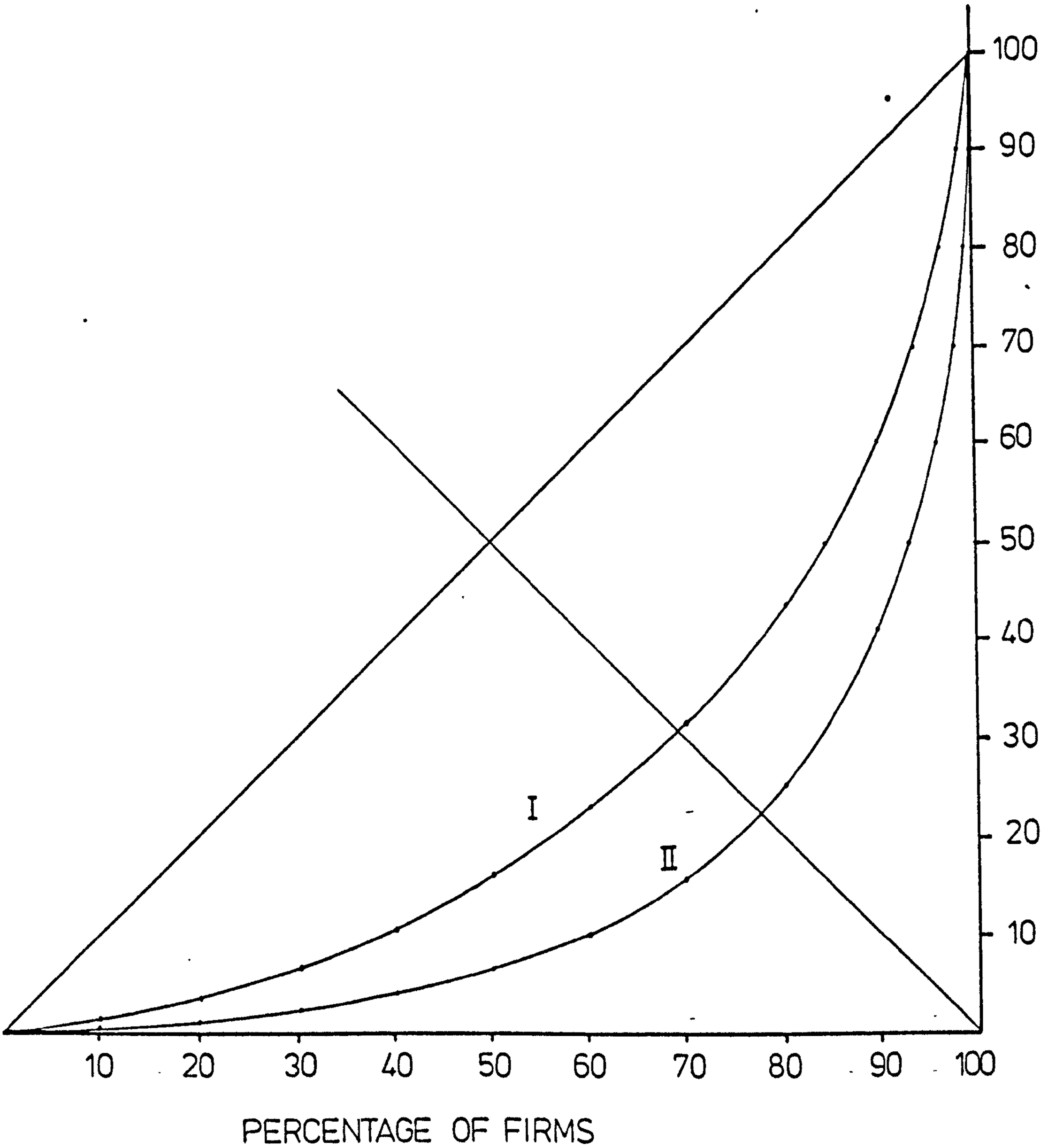
The distribution presented in Table III-2 is insufficiently unequal to demonstrate clearly the properties of a Lorenz curve for a lognormal distribution. Instead let us consider a normally distributed variable X with mean 2.0 and standard deviation of 1.0. If we now examine the distribution of e^X and calculate the coordinates of points on the Lorenz curve, the symmetry of the curve becomes apparent. The calculation is shown in Table III-3 and the curve itself is shown as line 1 in Figure III-2.

Table III-3 Calculation of Lorenz curve coordinates for e^X where X is normally distributed with mean 2.0 and standard deviation 1.0

No. of firms (ascending order)	Value of variable For Group	Value of variable Cumulative	Cumulative variable as % of total
10	14.41	14.14	1.15
20	26.77	40.91	3.33
30	38.27	79.18	6.44
40	50.40	129.58	10.54
50	66.79	196.37	15.97
60	82.97	279.34	22.72
70	107.63	386.97	31.48
80	143.87	530.84	43.18
90	210.83	741.67	60.32
100	487.78	1229.45	100.00

FIGURE III-2 LORENZ CURVES OF LOGNORMAL DISTRIBUTIONS

CURVE I: MEAN LOG. 2·0, STANDARD DEVIATION 1·0
CURVE II: MEAN LOG 2·0, STANDARD DEVIATION 1·5



From the graph this symmetry is evident - if x per cent of the firms in ascending order account for y per cent of the variable, then y per cent of the firms in descending order account for x per cent of the variable.

The Lorenz curve for a distribution of e^X where X is normally distributed is determined exclusively by the standard deviation of X. Line II in Figure III-2 is derived from the antilogged values of a distribution with mean 2.0 and standard deviation 1.5.

3. The Gini Coefficient

This is the ratio of the area between the Lorenz curve and the 45° line in Figure III-2 to the total area of the triangle formed by the 45° line and the axis. The 45° line represents equality of size where p per cent of the firms account for p per cent of the total variable. If all firms except one were of negligible size then the Lorenz curve would almost follow the axis. The Gini coefficient can therefore vary between 0 (when the Lorenz curve corresponds to the 45° line) and (n-1)/n. In Figure IV-2 the Gini coefficient corresponding to curve I is 0.527; that corresponding to curve II os 0.728.

Gini himself (Ref. 66) pointed out that a measure of concentration may be derived by taking the mean difference irrespective of sign between all possible pairs of firms.

$$D = \Sigma_i \Sigma_j |x_i - x_j| / n^2$$

and that the Gini coefficient $g = D/2\bar{X}$

This interesting feature of the Gini coefficient is discussed by de Bandt (Ref. 45,pp. 48-49) and, in less detail but in English by Hart and Prais (Ref. 56). Both sources refer to a formal proof by Kendall (Ref. 67, p.44).

The main hazard in use of Gini coefficients to compare distributions is that, as with the coefficient of variation described above, the comparison will be distorted if the distributions differ in shape. In the case of the Gini coefficient it is necessary for the distributions of the standard deviates of logarithms to be identical. If one is to compare two lognormal distributions then the danger does not arise: the Lorenz curves are symmetrical and a given Gini coefficient describes a unique Lorenz curve.

Once the assumption of lognormality is dropped and the distributions differ in shape then the Gini coefficient ceases to be a reliable measure of degrees of inequality. This can be demonstrated by a numerical example with two different distributions of firms.

FIGURE III-3 LORENZ CURVES DESCRIBED IN TABLE III-4

(SAME GINI COEFFICIENT)

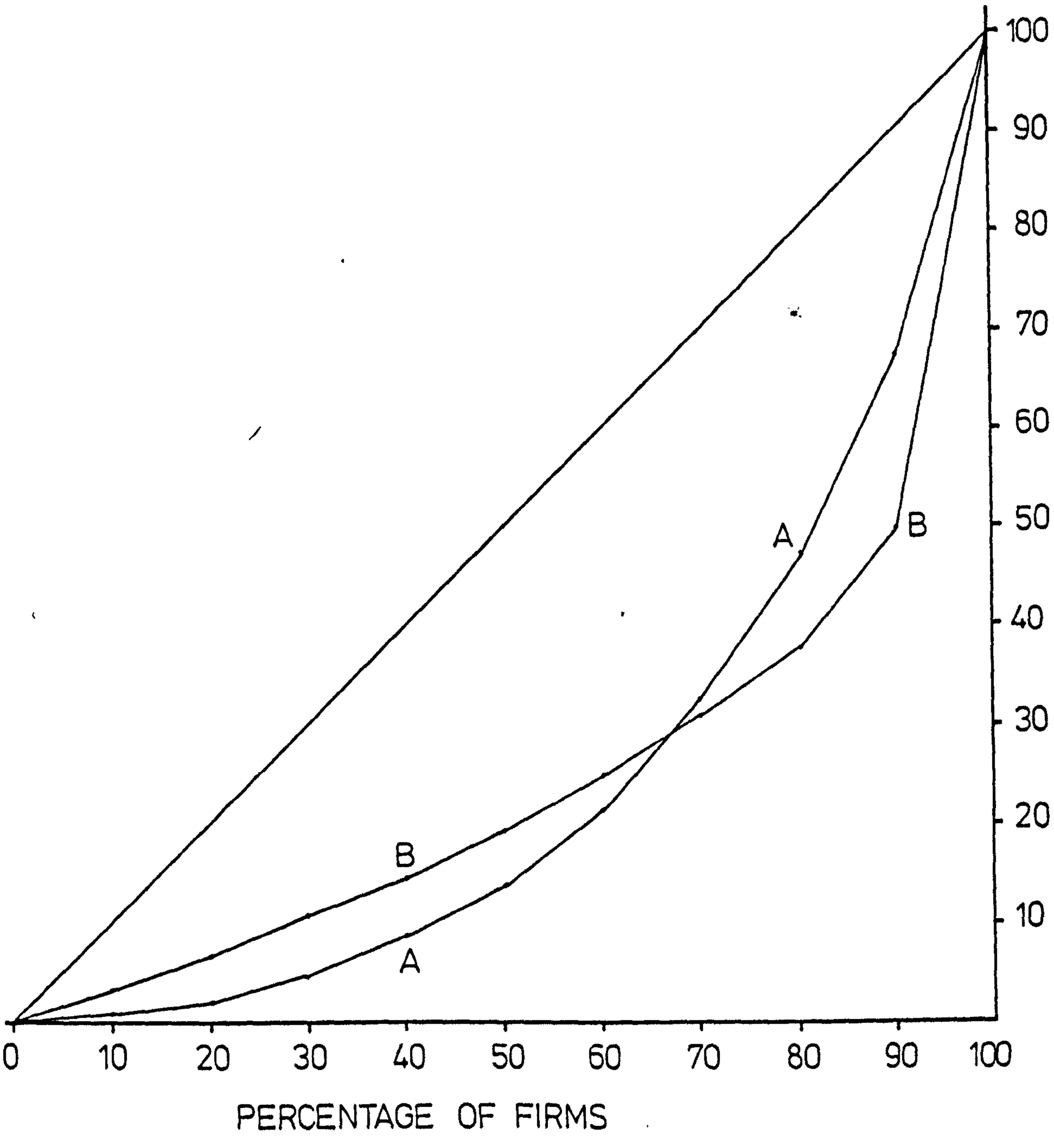


Table III-4 Two different distributions with the same Gini coefficient

Cumulative % of firms	Cumulative percentages of total sales	
	A	B
10	0.8	3.0
20	2.4	6.8
30	4.8	10.8
40	8.9	15.0
50	14.5	19.5
60	22.6	24.8
70	33.1	31.5
80	47.6	38.0
90	67.7	50.6
100	100.0	100.0

In both cases the Gini coefficient (based on the decile values) is 0.500, the area enclosed by the two Lorenz curves, here simplified to a series of ten straight lines, is half the triangle under the 45° line. Yet in distribution B the largest 10 per cent of firms accounts for 49.4 per cent of total sales whereas in distribution A the corresponding proportion is only 32.3 per cent. Figure III-3 shows these two Lorenz curves: the Gini coefficient is the same for each curve because the area between the curves to the left of the intersection is equal to the corresponding area to the right.

Certain authors, for example, for example Morvan (Ref. 44) and de Bandt (Ref. 45) tend to reject the Gini coefficient on the grounds that in most practical cases the Lorenz curve is not symmetrical - the values of the variable considered are unlikely to be lognormally distributed. Before assessing the conclusion that symmetry of the Lorenz curve is necessary for use of the Gini coefficient, the validity of the lognormal distribution (which implies symmetry) will be examined.

4. The Lognormal Distribution in Statistical Studies of Concentration

In order to test whether the distribution of the logarithms of company sizes is normal Hart and Prais used the tests set out by R.A. Fisher (Ref. 68), who defined coefficients of skewness (g_1) and of kurtosis. For the purposes of testing the symmetry of the Lorenz curve, the skewness coefficient is more important.

$$g_1 = \frac{n\Sigma(X - \bar{X})^3}{(n-1)(n-2)} \Big/ \left(\frac{\Sigma(X - \bar{X})^2}{n-1}\right)^3$$

which is a sample estimate of the third moment of the distribution divided by the cube of the standard deviation.

The standard error of $g_1 = \frac{6n(n-1)}{(n-2)(n+1)(n+3)}$

Hart and Prais (Ref. 56, p. 159) found a statistically significant positive skew in the distribution of the market valuation of quoted companies in 1907, 1924, 1939 and 1950 but found no significant skew (g_1 was in fact negative but was exceeded by its standard error) in 1885 and 1896. They attributed the positive skewness from 1907 onwards to the "artificial" dividing line between quoted and unquoted companies. The quoted sector might represent the upper part of the lognormal distribution and without the left-hand tail skewness is inevitable.

The argument that the distribution of companies in U.K. industry is lognormal appears to rest on slender evidence. Hart and Prais provided a reasonable explanation of the positive skewness in the logarithmic distribution of sizes of quoted companies but could not prove that a distribution including unquoted comapnies would have been lognormal. Prais (Ref. 46, p. 193) recently applied the lognormal distribution to the distribution by employment of all manufacturing companies in the U.K. including those employing fewer than 25 persons. Although the percentages correspond fairly well, my own attempt to repeat this test revealed statistically significant positive skewness but the calculation is very sensitive to the assumption about the distribution of firms within the open-ended classes.

In practice, a lognormal distribution is unlikely to be found in surveys conducted for the E.E.C. studies mainly because a lower size limit is prescribed which might lead to the exclusion of the majority of companies, which are very small. Table III-4 shows the numbers of companies excluded from the samples for the three studies in which numbers of companies were reasonably high (the vehicle accessory study was concerned essentially with highly oligopolistic markets).

Table III-4 Cranfield studies in concentration series - numbers of enterprises compared with 1968 Census of Production

	Census (Enterprise tables)	Cranfield report (EAU)
Paper and board manufacture	170	64
Manufactured stationery	245	14
Non-board packaging	124	27
Board packaging	480	108
Miscellaneous paper products	222	21
Cotton etc. spinning	259*	(
weaving	410*	(52
Hosiery and knitwear	867	60
Wool and worsted	965	60
Newspapers and periodicals	715	35
All publishing	n.a.	59

* The figures cannot be added because of vertical integration.

The sample sizes were determined mainly by the need to have a sector total of 60 firms, the limit of the Commission's own computing capacity. Because we undertook our own computing this limit was not universally observed. In certain cases the sample was reduced to well below sixty; because this reduced number accounted for the vast majority of the sub-sector, extension of the investigation would have been expensive and of marginal benefit, particularly since it meant reliance on accounts of private companies. For example, the 35 Press companies accounted for over 85 per cent of added value from newspaper and periodical publishing and 92 per cent of newspaper circulation.

Since we were examining only the upper part of the distribution of company sizes, it is not surprising that tests for lognormality showed significant departure from this theoretical model.

In the paper industry study (Ref. 1, pp. 51-3) the distributions of turnover from paper conversion (179 firms in 1968, 171 in 1970 and 145 in 1972), and from board packaging in particular (108 firms in 1968, 105 in 1970 and 102 in 1972) were compared with theoretical lognormal distributions. These were based on the standard deviation of the logarithms of the sample. All six distributions shared positive skewness and the difference from lognormality was shown to be significant by the χ^2 test.

Similar tests for the textile industry were not reported because they added nothing of methodological interest and proved little because of the exclusion of a significant proportion of industry turnover.

The Fisher test quoted on p.55 above was applied to the publishing turnover data for alternate years 1969-1975 and revealed significant positive skewness (g_1 was significantly different from zero). The 35 observations of Press turnover showed neither statistically significant skewness nor any kurtosis but the absolute value of g_1 was higher than that for all publishing and it was insignificant only because of a high standard error.

An alternative test for the existence of a lognormal distribution may be the subject of further research. If we know, as for example, in hosiery and knitwear, that our sample represents 60/867 or 6.9 per cent of the total number of firms in an industry, then if the total number were lognormally distributed, the standard deviation (s) of that lognormal distribution could be calculated from the 60 observations and the use of the co-ordinates of the normal distribution.

For example the logarithm of the turnover of the 22nd largest of the 60 firms ($0.025 \times 867 \simeq 22$) would be approximately $m + 2s$; that of the 58th firm ($0.0668 \times 867 \simeq 58$) would be $m + 1.5s$. Hence $s = 2 \times (\text{Log sales}_{22} - \text{Log sales}_{58})$. By use of other pairs, the effect of statistical inaccuracies could be averaged out and the validity of the lognormal hypothesis could finally be tested by χ^2. This will be the subject of further research - it lies beyond the purposes of this present synopsis. I am surprised not to have found this suggested approach in the literature.

Because statistical investigations of concentration normally include only a small proportion of a total number of business units (but a large proportion of total output) they are unlikely to find that the sample is lognormally distributed.

5. Asymmetrical log-distribution and its consequences

The previous sub-section reported that distributions of sales turnover in all of the Cranfield studies were significantly different from lognormal and that the logarithms of sales showed a positive skew. This could well be because the samples might represent the upper tails of lognormally distributed populations - but this still requires empirical proof.

If the distributions being compared had the same degree of skewness and kurtosis then the Gini coefficient and the Lorenz curve could still be used as unambiguous measures of inequality. This can be shown by reference again to the two distributions described in Figure III-2 in which 100 values were distributed lognormally

with a mean logarithm of 2.0 and standard deviation of logarithms of 1.0 (distribution I) and 1.5 (distribution II).

If we plot the Lorenz curves for the first 20 values of these distributions, as shown in Figure III-4 it is apparent that these have the same degree of asymmetry. The proportions of the area between the 45° line representing equality and the Lorenz curve which lie left and right of the broken 45° line are the same for both distributions. Provided (a) the proportion of total firms included in the sample is constant and (b) the totality of firms is lognormally distributed, the Gini coefficient remains an unambiguous measure of inequality. The first condition is almost impossible to fulfil in practice, the second condition remains unproven.

This does not mean that transformation to logarithms or the use of the Gini coefficient is invalidated. The distribution of logarithms of sizes of firms has been found in our own and other studies to have a positive skew; the distribution of the anti-logarithms must be even more skewed. This means that the Gini coefficient, while it can reflect more than one distributive pattern, is likely to be more reliable than the coefficient of variation. It is also likely to be more stable, being less affected than the coefficient of variation by small proportionate changes in the market shares of the largest firms.

This greater stability of the Gini coefficient can be demonstrated from our own reports. Table III-5 compares the variation over time of (i) the coefficient of variation and (ii) the Gini coefficient of sales turnover.

Table III-5 Comparative Stability of Coefficient of Variation (V) and Gini coefficient (G) for Sales Turnover

Industry or sub-sector	No. of years	V High	V Low	V(V)	G High	G Low	V(G)
Paper manufacture	5	2.10	2.03	.013	.736	.715	.011
Paper conversion	5	4.09	3.49	.055	.831	.823	.004
Textiles (EAU)	6	2.15	1.94	.052	.653	.616	.018
Cotton etc.	5	2.12	1.80	.054	.707	.663	.021
Wool & worsted	6	1.72	1.38	.067	.595	.560	.021
Hosiery & Knitwear	6	2.61	2.39	.028	.698	.684	.007
Publishing (EAU)	8	2.27	1.86	.082	.705	.656	.027

* V(V) and V(G) are the coefficients of variation of (i) the coefficient of variation and (ii) the Gini coefficient respectively.

FIGURE III-4 TWO LORENZ CURVES WITH SAME DEGREE OF ASYMMETRY

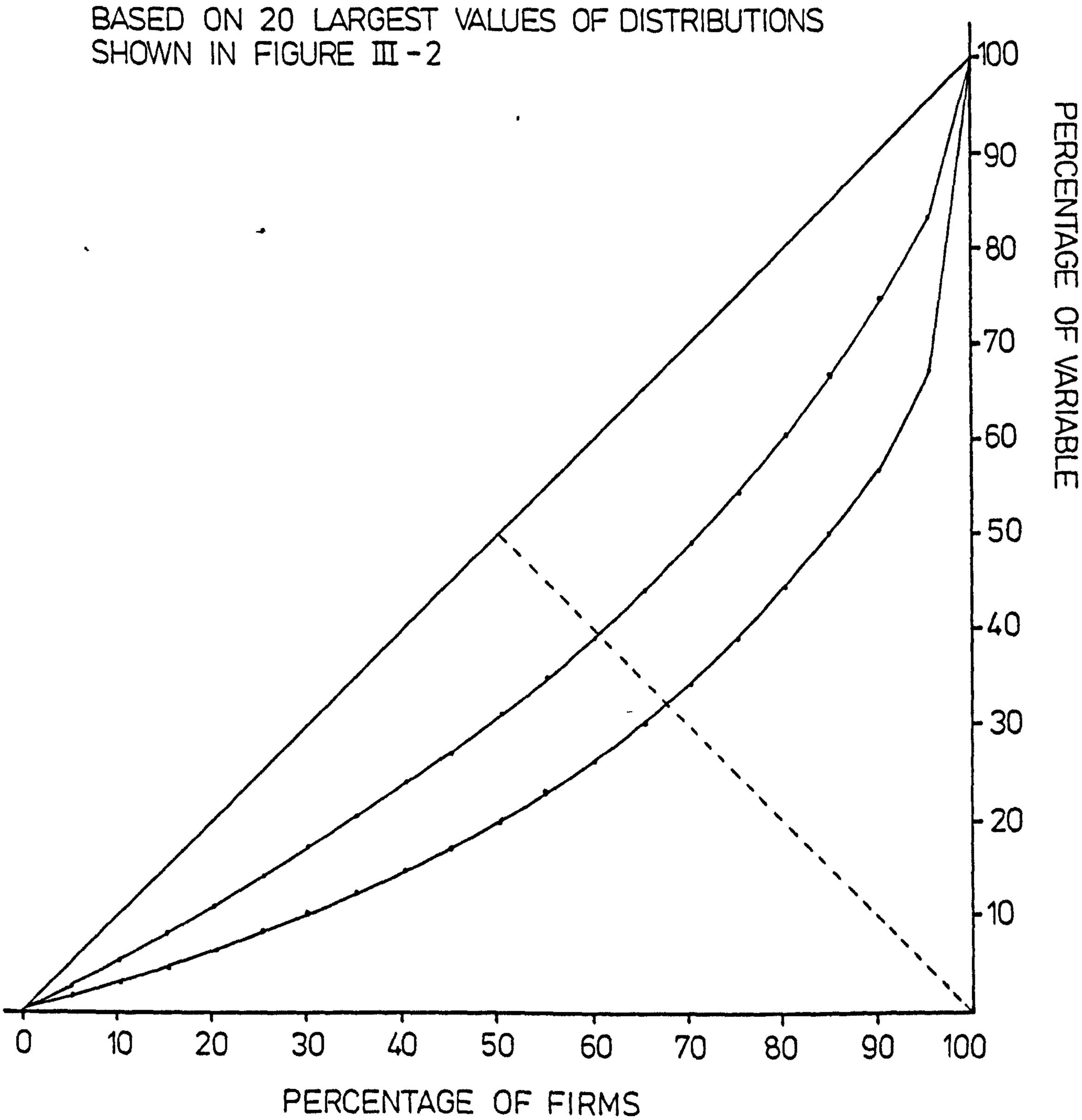


Table III-5 shows that in all seven cases the Gini coefficient was more stable than the coefficient of variation and, except in the case of paper manufacture, this difference in stability was quite pronounced.

6. Concluding remarks on measures based only on inequality

The coefficient of variation, the variance of logarithms and the Gini coefficient are unaffected by the number of firms as such. For example, the Lorenz curve based on deciles would take the same shape irrespective of the number of units within each 10 per cent. All of those who advocate the use of such measures also refer to the need to consider separately the number of firms.

How important is inequality throughout the industry and how satisfactorily is it described by the coefficients? The coefficient of variation has been criticised in this section because it can be used as an unambiguous measure to compare distributions only when these are identical in terms of standard deviates. Because it is based on absolute numbers it is unlikely that this condition will be met (differing degrees of positive skewness) and it has been shown to be very sensitive to minor changes affecting the upper end of the distribution. Transformation to logarithms reduces but does not eliminate positive skewness - the Gini coefficient can be used as an unambiguous measure for comparison of distributions only when these are identical in terms of standard deviates of logarithms. This condition is more likely to be approximated to than is the case with absolute numbers but it is unlikely to be fulfilled either precisely or universally.

There are a priori grounds for expecting a lognormal distribution of company size but the empirical evidence remains tenuous. Statistical tests based on large-firm samples are likely to show positive logarithmic skewness when the total population is lognormally distributed, because the lower tail of the distribution is cut off.

Reference has already been made to the views of authors, including Linda of the European Communities Commission, who regard the study of all-industry inequality as of minor relevance to business concentration. Practical arguments, for example those put forward by Linda in the Commission's Methodology (Ref. 39, p.16) concern the need to collect data for a very large number of firms, including units which may not always produce the information required. The effect of transformation to logarithms is to increase the relative importance of smaller units so that reliability of information is necessary. In principle, a finding that the 120th firm is double the size of the 150th, (if they have 0.02 and 0.01 per cent of the market) is unimportant compared with observation that the five largest firms have 20, 17, 18, 15 and 8 per cent. The measures based only on inequality are probably only of peripheral significance in studies of the kind pursued in this series.

C. OTHER MEASURES BASED ON THE ENTIRE SAMPLE

1. Herfindahl-Hirschman Index

This measure is named after two authors who developed a very similar measure - Hirschman in 1945 (Ref. 69) and Herfindahl in 1950 (Ref. 70). Herfindahl's formula is now used:-

$$H = \sum_{i=1}^{n} (X_i / \Sigma X_i)^2$$

$(X_i/\Sigma X_i)^2$, the square of each company's share can be interpreted as the probability that any two separate and equal purchases would be placed with the same firm.

The Herfindahl-Hirschman index combines the coefficient of variation (V) and the number of firms included (n):-

$$H = \sum_{i=1}^{n} (X_i / \Sigma X_i)^2 = X_i^2/(\Sigma X_i)^2$$

It can be shown by substitution for V that $H = \frac{V^2 + 1}{n}$

Thus defined, the maximum value of the index is 1 (where one firm controls the entire industry) and the minimum is $\frac{1}{n}$, when all the firms are of equal size, so that the sum of the squares of market shares is (n/n^2). The Commission of the European Communities follows a convention whereby the Herfindahl-Hirschman index is multiplied by 1,000 (to vary between 1000/n and 1000).

Strong support for H as a measure of concentration was provided by Hall and Tideman (Ref. 71). They proposed six properties which a measure of concentration "ought to have":-

(i) The measure must be unidimensional, capable of showing that one distribution is more concentrated than another

(ii) Contrary to Adelman (Ref. 48) they argue that the concentration measure should take the whole industry (or as much as possible) into account.

(iii) An increase in the share of a higher ranked firm at the expense of that of a lower ranked firm should increase concentration

(iv) If industry A has k times the number of firms in industry B and for each firm of size p_i in industry A there are k firms of size p_i/k in industry B then the concentration

measure for A should be 1/k times that for B

(v) When there are n firms of equal size the index should be equal to or related to 1/n

(vi) The index should, for convenience, vary from 0 to 1 or be capable of transformation to this range.

The Herfindahl-Hirschman (H) was seen as having all six properties, though (vi) appears to me to be violated - the minimum cannot easily be transformed to zero. Hall and Tideman preferred to modify it because it is more sensitive to inequality than to numbers of firms. This can be shown by using the formula containing the coefficient of variation and the number of firms. Because V^2 is in the numerator and n in the denominator a doubling of the degree of dispersion accompanied by a doubling in the number of firms would lead to a rise in the index.

An interesting conclusion of Hall and Tideman's paper is the very close correlation between H and four-firm concentration ratios for 446 industries in the U.S. Census of Production 1968. The coefficient of rank correlation was 0.995 and the simple linear correlation coefficient 0.976.

Hall and Tideman accepted that H and their modification of it (which has not been more widely used and is not discussed further), because they are affected both by the degree of inequality and the number of firms, can represent widely different distributions. The same index can summarise a distribution with wide inequality but a large number of firms or one with a few firms more equal in size. They regarded this as inevitable but "we should expect that under some situations the trade off between numbers and inequality would be such as to allow industries with different size distributions to be viewed as equally concentrated".

The ambiguity of the Herfindahl-Hirschman (H) measure is greater than this. In the discussion of the coefficient of variation (V), it was pointed out that the same coefficient could represent widely differing distributions and was particularly sensitive to small proportionate changes affecting the largest firms. Since H is a function of V^2, these criticisms apply fortiori to it.

The two distributions shown on page 46 above with the same coefficient of variation also have the same H coefficient, 0.105 or, in the Commission's terminology 105. In one case the size of the largest unit is 2.7 times that of the smallest; in the other the ratio is less than 2.0.

Since the Herfindahl-Hirschman index is related to the coefficient of variation, de Bandt rejected it (Ref. 45, p. 51) as a measure of concentration because of the skewness of the distribution of company size. He proposed a revised version based on a weighted geometric mean of market shares.

whereas $H = \frac{\Sigma X_i^2}{\Sigma(X_i)^2} = \frac{1}{\Sigma X_i} \quad \frac{\Sigma X_i^2}{(\Sigma X_i)}$

de Bandt's modification $= \frac{1}{\Sigma X_i} \sum \frac{X_i \log X_i}{\Sigma X_i}$

De Bandt's modification restores to smaller firms a greater contribution to the Herfindahl-Hirschman index. The latter can be estimated fairly closely on the basis of the largest firms; inclusion of all companies is unnecessary. Nelson (Ref. 72, p. 19) stated "the contribution to the total index of units ranking below 50th in size is so small as to have virtually no effect on its absolute value".

Vanlommel et al (Ref. 57, p.15) view the high correlation between H and C_4 (the four-firm concentration ratio) as encouraging for those preferring to use the latter, simpler measure. Their Belgian studies related to establishments and the lower value of $r_{HC_4} = 0.80$ may reflect this. A selection of our own results confirms the correlation:-

Table IV-7 Four-firm concentration and H coefficient (turnover)

Sector/market and date		Variable	C_4	H(1000)	Rank C_4	Rank H
Paper manufacture	1972	Sales	49.0	78.9	11	11
conversion	1972	Sales	53.0	91.1	8	10
Cotton, etc.	1973	Sales	56.0	103.5	7	8
Wool & worsted	1973	Sales	41.6	62.3	14	14
Hosiery & knit	1973	Sales	52.1	111.8	9	7
Tyres U.K.	1975	Sales	89.2	279.8	2	2
Tyres worldwide	1975	Sales	87.4	214.3	3	4
Accumulators	1975	Volume	75	182	4	5
Spark plugs	1975	Volume	96	459	1	1
All publishing	1975	Sales	45.1	73.2	13	13
Press	1975	Sales	50.7	97.3	10	9
Newspaper	1975	Circ.	64.1	121.5	6	6
Periodicals	1975	Retail sales	73.6	264.5	5	3
School texts	1975	Purchases	45.8	76.3	12	12

The simple correlation coefficient between C_4 and H is 0.910 and the coefficient of rank correlation = 0.952. I have not included more than one observation for each sub-sector (over time) because these might not be independent observations. With 12 degrees of freedom both coefficients are very significantly different from zero but the sample size is too small for calculation of a reasonably accurate lower confidence limits for the correlations.

Enthusiasm for the Herfindahl-Hirschman index appears to be based on its ability to reflect large-firm dominance while taking into account all units in the industry. Its critics state that it is unduly influenced by larger firms in the skewed distribution generally found. This is obviously the reason for its correlation with the four-firm concentration ratio. Final evaluation of this measure depends upon how far the users of concentration indices wish them to reflect the position of the largest units rather than describe the entire distribution.

2. The Entropy Measure

This concept has its origins in information theory and its application to business concentration was suggested by Theil et al in the mid- 1960's (Ref. 73 and 74). It is the weighted total of the logarithms of market shares

$$E = c \sum_{i=1}^{n} P_i \log_e P_i \quad \text{where} \quad P_i = X_i / \Sigma X_i$$

Since $P_i < 1$ the entropy measure as defined here will always be negative. Some authors prefer to reverse the sign and normal practice is to set c = 1. This presentation is followed in certain of our explanatory notes in the reports for the E.E.C. The Commission prefers to set c = 100 and accept negative values - our statistical results reflect this. Its maximum value is zero, when one firm has a 100 per cent market share so that $P_i = 1$ and $\log P_i = 0$. The minimum value of E occurs when all firms are of equal size 1/n. In this case $P_i \log P_i = c(\log n)/n$ and the total of n values is c log n.

The entropy measure is more sensitive to the number of firms than the Herfindahl-Hirschman index. For a lognormal distribution $E = c\left(\frac{S^2}{2} - \log_e n\right)$. One important property is cardinal consistency in response to a change in the number of firms.

For example, if there were 32 firms of equal size in an industry then the entropy index would be:-

$$E = 100 \times 32 \times .03125 \times \log_e .03125 = -346.6$$

If the number of firms fell by a quarter to 24 then

$$E = 100 \times 24 \times .04167 \times \log_e .04167 = -317.8$$

If it now fell by another quarter to 18 then

$$E = 100 \times 18 \times .0556 \times \log_e .0556 = -289.0$$

On each occasion the value of E has changed by 28.8, which is 100 times the change in the logarithm of market share.

The entropy measure has attracted relatively little attention in the literature on concentration. Hart in 1971 (Ref. 75) suggested an entropy-related measure:-

$$\text{"Redundancy"} = E_{min} - E = c \log_e n - E$$

Since in a lognormal distribution $E = c\frac{S^2}{2} - \log_e n$ Redundancy $= \frac{cS^2}{2}$

and, with the arbitrary (and unnecessary!) constant set equal to unity, Hart's measure becomes half the variance of the logarithms. This means, in the light of that author's favour towards the log-normal distribution and its variance, that the "redundancy" measure is declared redundant by its creator!

Vanlommel et al (Ref. 57) showed that for their Belgian data the entropy measure was almost perfectly correlated with the four-firm concentration ratio C_4. Substituting entropy values into Table III-7 in place of the Herfindahl-Hirschman index, it appears from our studies that the simple correlation with C_4 is 0.984 and the rank correlation is 0.943. Our own results provide support (only tentative because of the sample size) for the thesis of the Antwerp group, that the entropy measure is even more closely correlated with C_4 than the Herfindahl-Hirschman index.

From this argument it is clear that the entropy and the Herfindahl-Hirschman measures must themselves be closely related. Vanlommel et al found a correlation coefficient of 0.82; our own results for the 14 sectors/sub-sectors shown in Table III-7 give a simple correlation coefficient of 0.931 and a rank correlation coefficient of 0.952.

There are certain advantages of the entropy measure over the Herfindahl-Hirschman index such as its greater sensitivity to the number of firms and its cardinal consistency in reflecting changes in that number.

Further appraisal of the properties of the entropy index is being undertaken by econometricians in Brussels and more detailed study is planned at Cranfield. The shortage of time imposed by the deadlines for the Commission studies and the sponsor's emphasis

on the oligopoly measures discussed below has precluded fuller examination of the entropy measure, which does not appear to have been analysed extensively elsewhere.

3. The Rosenbluth Index

This index is not prescribed by the Commission and is mentioned here because it is the only widely used index which is not so prescribed. Designed by Rosenbluth in the 1950's (Ref. 76), it combines the Gini coefficient (G) and the number of firms (n)

$$R = \frac{1}{2(\sum_{i=1}^{n} iP_i - 0.5)}$$

where $P_i = X_i / \Sigma X_i$ and firms are arranged in descending order, so that $i = 1$ for the largest unit.

Buyse (Ref. 77) points out the relationship between R and G.

$$R = \frac{1}{n(1-G)}$$

The minimum value of the index, when G = 0, is $1/n$ and the maximum value when $G = (n-1)/n$ and $n = 1$ is 1.

The Rosenbluth index is less sensitive to small changes affecting the largest units than either the Herfindahl-Hirschman index or the entropy measure. The term ip_i is such that falling values of p_i are compensated by increasing i, whereas the Herfindahl measure uses p_i^2.

D. CONCLUSIONS

Since concentration depends partly upon the number of units in a distribution and partly upon the degree of inequality among those units, any single measure which is determined by both elements is likely to be ambiguous.

In this chapter I have attempted to summarise the argument that inequality is likely to be measured more consistently by use of indices relating to the logarithms of size. Such measures include the Gini coefficient and the variance of logarithms; they would be preferred to the coefficient of variation of absolute size, which is likely to be unduly sensitive to changes in the sizes of the largest firms. All three measures are unaffected by the number of firms and could not be used alone to describe concentration.

Because it is related to the coefficient of variation, the Herfindahl-Hirschman index will also be considerably affected by small changes in the sizes of the largest firms. The Entropy measure appears to have certain advantages which justify more attention than it has so far received. More detailed study of this and of the Rosenbluth index will form part of further research at Cranfield into this subject.

CHAPTER FOUR: STATISTICAL ANALYSIS OF OLIGOPOLY

A. INTRODUCTION

The Commission's interest in concentration is due mainly to its implications for dominance and the market. In Chapter One, section C, was described the Commission's emphasis on the study of oligopoly and the philosophy which underlies its approach to the analysis of oligopoly - an approach which measures interdependence, inequality and dynamism. In Chapter Three it was pointed out that several authors have argued that statistical measurement of concentration needs to focus upon the largest firms. A further quotation, this time from Adelman (Ref. 48, p.4-5) serves to emphasise their view:-

> " ... our interest in the phenomena of big business and industrial concentration is not confined to the primary focus of great inequality of distribution; it is concerned also with small absolute numbers. What we are really trying to describe are the very small number of very large firms and their place in the economy".

Because of the large positive skew usually found in distributions of company sizes the Herfindahl-Hirschman and the Entropy index, which are influenced by absolute numbers are both very sensitive to changes in the size of the largest firms. Some critics view this as a weakness; others regard the high correlation with C_4 as a strength. However, these two indices are not specifically designed for the study of oligopoly. Following Adelman's argument there appears to be a case for examination of the comparative strength of the largest firms - for examining the degree of inequality among those enterprises who form an oligopoly group.

B. EARLIER ATTEMPTS TO MEASURE INEQUALITY WITHIN OLIGOPOLY

1. Exponential Functions (Simple and Modified)

Adelman (Ref. 48 pp. 7-8) suggested a measure of relative size based on concentration ratios. If C_r represents the combined proportion of sales accounted for by the r largest firms ($C_r = \sum_{i=1}^{r} X_i / \sum_{i=1}^{n} X_i$) then a measure of average inequality would be the coefficient b in the equation:-

$$C_r = 1 - e^{-br}$$

Adelman went on to describe trials of this equation at the Massachusetts Institute of Technology which indicated that it was insufficiently flexible.

A test on the sales turnover of the 20 largest firms in publishing in 1975 revealed the problem:-

If $C_r = 1 - e^{-br}$

Then $\text{Log}_e(1 - C_r) = -br$

On values of r = 1 to 20 the equation for the publishing data gave the value of b as 0.09768 but, although the R^2 value was 0.87, the curve did not describe the relationship correctly. This is obvious from the graph (curve I in Figure IV-1). The Durbin-Watson coefficient was 0.039, though this information is clearly of academic interest only.

Two corrections were then attempted; the first recognised that the values of C_r were based on a sample which included 90.7 per cent of total publishing sales. The concentration ratios were adjusted accordingly and the equation tested was

$$\text{Log}_e(1 - 0.907C_r) = -0.0873r$$

This correction did not affect the predicted values of C_r at all significantly - if the resulting curve were superimposed on Figure V-1, it would correspond with curve II.

The second correction was the inclusion of another constant in the equation, which now became

$$\text{Log}_e(1 - C_r) = a - br$$

$$\text{or} \quad 1 - C_r = e^a e^{-br}$$

This equation gave a much closer result, depicted on Figure IV-2.

$$\text{Log}_e(1 - C_r) = -.30213 - 0.07557r \quad R^2 = 0.976$$

$$DW = 0.154$$

Despite the higher value of R^2, the Durbin-Watson coefficient confirms the (visually evident) existence of autocorrelation.

Figure IV-2 indicates that the modified exponential function cannot describe the actual relationship between C_r and r because of the discontinuity which occurs at r = 6. For values of r from 2 to 6, the change in the logarithm of $(1-C_r)$ varies between -0.11 and -0.14. Beyond this point the change varies between -0.063 and -0.087. The second derivative at this point has its highest absolute value.

This discontinuity in the concentration ratio curve may be interpreted as a demarcation between two groups - a threshold in size between a group of distinctly larger firms to the left and other firms to the right. The firms to the left, if they are few in number may constitute an oligopoly group. In this case, their combined market share of the six is 57 per cent, that of the six next largest firms is only 15 per cent.

FIGURE IV-1 CONCENTRATION RATIOS IN U.K. PUBLISHING 1975

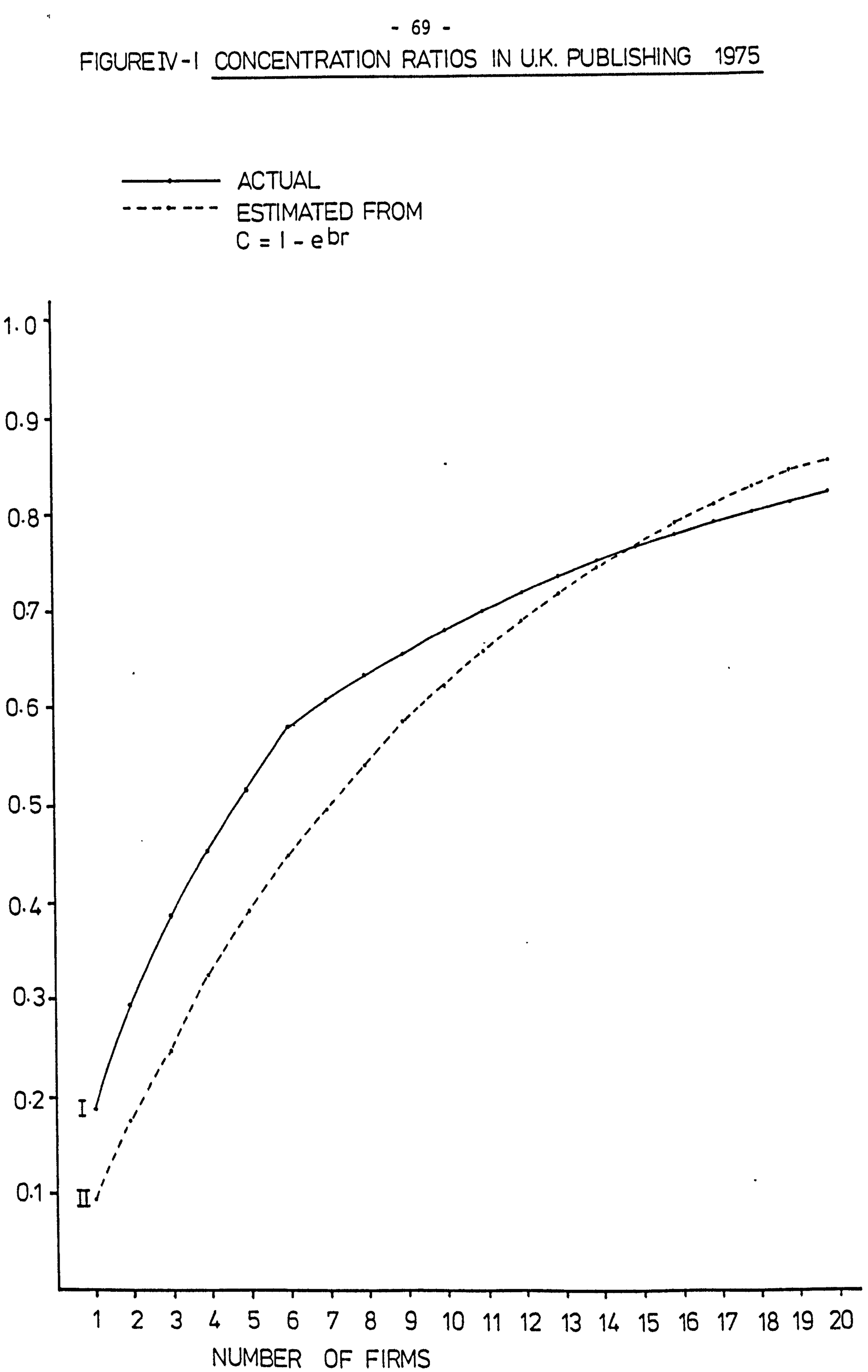
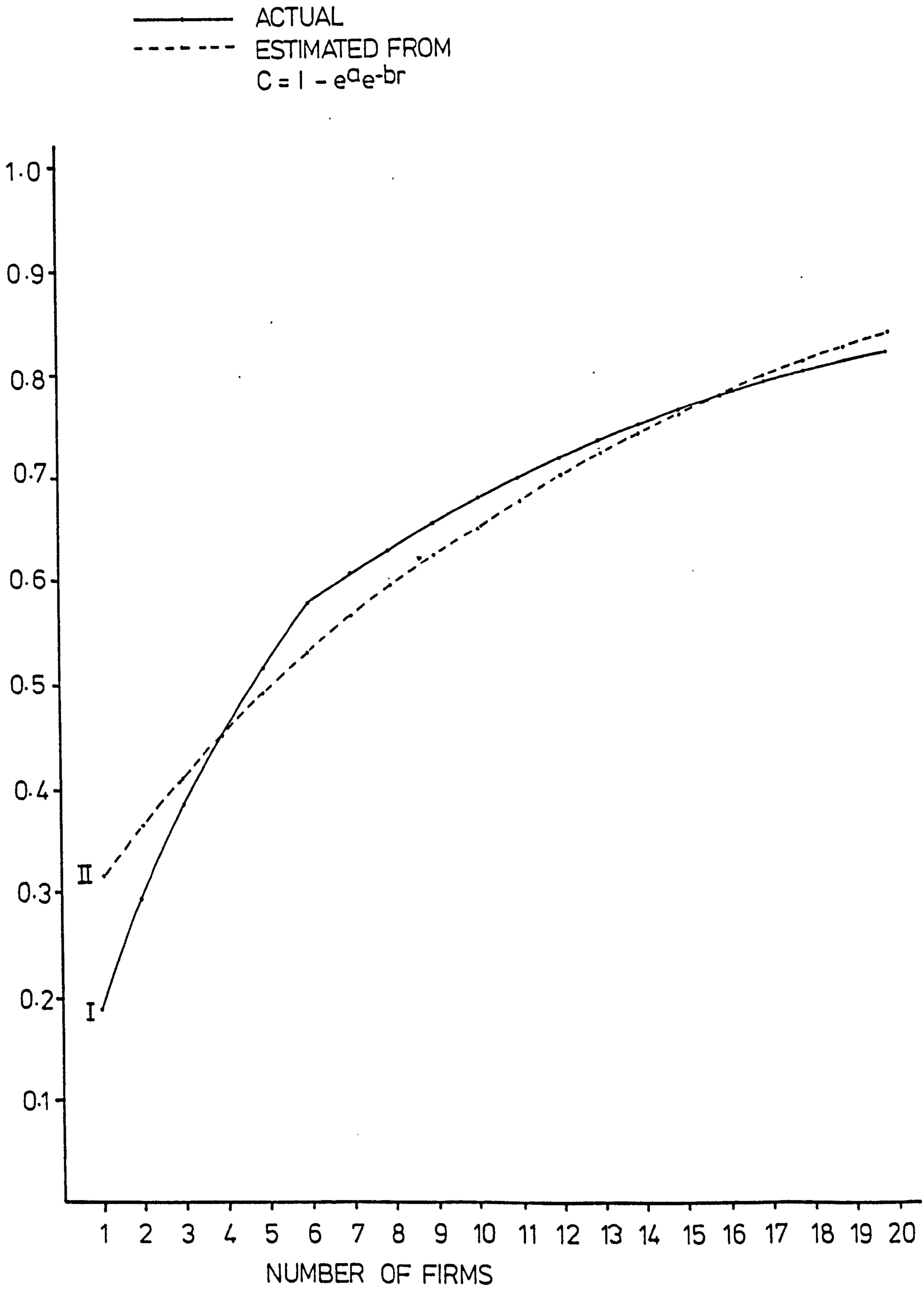


FIGURE IV-2 CONCENTRATION RATIOS IN U.K. PUBLISHING 1975



2. Hart's Summary Concentration Measure

Although Hart has consistently urged the use of the variance of the lognormal distribution as a measure of business concentration, he has also proposed (Ref. 75) as an indicator of oligopolistic concentration the mean of concentration ratios over a standard range:-

$$B_r = \frac{1}{r} \sum_{i=1}^{r} C_r$$

where r is an arbitrary number assigned consistently in all cases; the r firms are ranked in descending order.

B_r becomes a weighted average of market shares - the weight of the ith largest firm being (r - i + 1).

For example if p_i represents the proportion of the market held by firm i, then with r=3,

$$B_3 = \frac{1}{3} [p_1 + (p_1 + p_2) + (p_1 + p_2 + p_3)]$$

$$= \frac{1}{3} (3p_1 + 2p_2 + p_1)$$

This weighted average is a useful summary measure, reflecting not only the combined strength of the r firms but also the degree of concentration within the group. It does not make possible identification of the oligopoly group and the choice of r remains a somewhat arbitrary decision.

C. THE EVOLUTION OF THE LINDA INDEX UP TO 1977

One of the main advantages of the Linda index is its apparent power to determine the cut-off point referred to in Section B. It was not originally designed for this purpose: work on the index by Linda himself and by other economic statisticians has led to changes in the application of the concept and interpretation of the results. This section is a chronological survey of this evolution.

The definition of the Linda index remains that first published in 1967 (Ref. 36). If n firms are ranked in descending order of size (x):-

$$L_n = \frac{1}{n(n-1)} \sum_{i=1}^{n-1} \frac{(n-i)\, A_i}{i\ (1-A_i)} \qquad \text{where } A_i = \sum_{j=1}^{i} x_j \Big/ \sum_{j=1}^{n} x_j$$

This index reflects both the number of firms and the inequality between them. It may be considered as an average of (n-1) ratios of inequality, which is then divided by n to adjust for the number of firms.

To the reader who is encountering the Linda index for the first time, its disadvantage may be apparent. This is its complexity. The mathematical properties of the index can be analysed only by iterative computation.

The greater the Linda index for any given value of n, the greater the degree of inequality between the n firms. The smaller the value of n, the greater the interdependence among those firms.

1. Application and Interpretation of the Linda Index 1967-71

In his 1967 paper Linda defined n as the smallest number of firms with a combined market share exceeding 80 per cent. In this he was following Rosenbluth (Ref. 76). As well as L_n he also defined the following conceptual measures:-

M = the maximum value of EO_i/n within the (n-1) cases of EO_i

where $EO_i = \frac{A_i}{i} - \frac{(1-A_i)}{(n-i)} = \frac{(n-i)A_i}{i(1-A_i)}$

EO = equilibre oligopolistique

i* = the value of i at which M occurs

PL = $^1/n$ which is the value which would be taken by the Linda index if all firms are of equal size

I shall demonstrate these measures with a numerical example. Let us consider two distributions of five firms:-

Firm (i)	Series A	% share	Series B	% share
1	1000	29.75	1000	39.49
2	800	23.80	800	31.60
3	640	19.04	300	11.85
4	512	15.23	240	9.48
5	409.6	12.18	192	7.58
	3361.6		2532	

Let us now take n = 5 and show the computation of L_5 and the identification of M and i*

Table IV-1 Computation of Linda index and associated measures for Series A and B above (n=5)

	Series A		Series B	
i	A_i	$EO_i/5$	A_i	$EO_i/5$
1	0.2975	0.3388	0.3949	0.5221
2	0.5355	0.3459	0.7109	0.7377
3	0.7259	0.3531	0.8294	0.6482
4	0.8782	0.3605	0.9242	0.6096
	$L_5 = \frac{1.3161}{\div 4} = 0.3496$		$L_5 = \frac{2.5176}{\div 4} = 0.6294$	

In Series B, M is 0.7377 and i* is 2. This demarcation point corresponds to a discontinuity in the series, since $x_i = 0.8\ x_{i-1}$ except for $x_3 = 0.375x_2$. Linda described the i* firms as a "sub-group with abnormal power" (Ref. 36) and in his 1972 article defined (M-L) as the intensity of domination.

Reference to the results for Series A identifies a weakness: i* cannot exceed (n-1). The value of M (0.3605) corresponds to the fourth firm but one cannot state that there is a discontinuity between the fourth and fifth firm.

Morvan (Ref. 44) preferred a simpler interpretation of Linda's conceptual framework. Two results were important:-

n = the number of firms accounting for at least 80 per cent of the market

L_n-PL = the divergence between the degree of inequality among the n firms, as indicated by the Linda index, and complete equality which would be given by a Linda index equal to 1/n. Morvan called 1/n the "Modèle Concurrentiel" (MC) but it is equivalent to Linda's PL.

Used in this way, the Linda index was similar to Hart's summary measure. It did not define the oligopoly group.

2. The Application of the Linda Methodology 1972-7

In his 1972 paper (Ref. 37pp. 375 et seq.) Linda asserted that the index could be used to define an oligopolistic group within

a sample of n firms. This is done by the calculation of the Linda index for the n* largest of the n firms, for n* = 2, n* = 3 etc. until a minimum value is found. He quotes from a paper published in 1971 by R. Buyse (Ref. 78) "The oligopolistic arena ends at the lowest point of the Linda curve ... this definition is from the standpoint of mathematical logic rigorously objective". (see footnote*)

Support for this view was also provided by Marfels (Ref. 61). The first value of n*(n*m) at which a minimum value of L_{n*} occurs is the number of firms which form the oligopoly group. A minimum was defined as a value of the Linda index which is preceded and followed by higher values:-

$$L_{n*m-1} > L_{n*m} < L_{n*m+1}$$ (see footnote**)

The Linda index used in this way serves two purposes - identification of the oligopolistic group and measurement of the degree of inequality within that group. Since it incorporates 1/n* it also reflects the number of firms and the degree of interdependence between them.

Over the period 1972-7 Linda introduced a number of elaborations of his methodology for analysis of oligopoly. These are described in his 1976 publication (Ref. 39) and also appear in the textiles, vehicle accessories and publishing reports. They include L_{n*m} the first minimum of the Linda function with respect to n*, which has just been described and to which we shall return. They also include:-

(i) L_{n*h} = the first maximum value of L_{n*}

(ii) L_s = index of synthesis, which is the mean of values of L_{n*} from n* = 2 to n* = n*m

(iii) The matrices of oligopolistic interdependence based on rankings of variables by L_s and L_{n*n}.

* This is my own translation of part of Linda's quotation from Buyse.

** This conforms also with Linda's 1976 definition (Ref. 39 p.19) but there are also cases where $L_2 < L_3$. In these cases L_2 is deemed a minimum, according to recent verbal instructions from Linda, but there are interpretation problems, discussed on pages 81 and 82 below.

Following discussions with some of the leaders of research teams working on this series of concentration studies (including Cranfield), Linda is proposing to revise this methodology and these three particular elaborations are likely to be withdrawn or substantially modified. I do not propose to discuss them here since I do not think that they form an important part of the work completed at Cranfield.

Although the "coefficient of dominance" (M) and the "sub-group with abnormal power" (i*) were again described in Linda's 1972 article, they have received progressively less attention in sub-sequent presentations by Linda himself and were not mentioned in the 1976 methodology document (Ref. 39).

One application of the Linda index and associated measures, by Linda himself, has been to comparison of inequalities within different variables. The interpretation of the results is discussed in Section G below (p. 89).

D. VALIDATION OF THE LINDA INDEX

1. Introduction

Since 1972 the Linda index has been used to determine the "oligopolistic arena", as well as to measure the degree of ine-quality between the oligopolists and their interdependence. How effectively does it perform these functions?

I have already pointed out that this index can be analysed only by iteration. Support for this conclusion is provided by Marfels (Ref. 61p.255-7). In this section I shall summarise some of the relevant results from the four Cranfield studies and shall then examine some theoretical issues surrounding the existence of a minimum of the Linda index. The comments are confined entirely to results based on sales turnover or market share; discussion of the application of the methodology to other variables appears in Section G below.

Let us first examine the application of the Linda index to the 20 largest values of sales turnover in publishing in 1975, to which were fitted (in Section B.1 above) exponential and modified exponential curves.

Table IV-2 shows the concentration ratios and Linda indices.

Table IV-2 Publishing industry turnover (EAU) in 1975 - Concentration Ratios and Linda indices

No. of firms (n^*)	C_{n^*}	L_{n^*}	n^*	C_{n^*}	L_{n^*}
	(%)		11	70.2	0.309
1	18.9	-	12	72.2	0.293
2	29.9	0.861	13	74.0	0.280
3	39.0	0.586	14	75.5	0.275
4	45.1	0.522	15	76.9	0.270
5	51.0	0.428	16	78.0	0.268
6	56.9	0.352	17	79.1	0.265
7	60.3	0.355	18	80.1	0.260
8	63.4	0.339	19	81.1	0.256
9	65.8	0.336	20	82.0	0.252
10	68.1	0.321			

It can be seen that the Linda index has its first minimum value at $n^* = 6$, the point at which a discontinuity occurs in the concentration ratio curve in Figure IV-1.

This relationship between the first minimum of the Linda index and the discontinuity in the concentration ratios is shown graphically in the paper and textile studies. The graphs for board packaging (Ref. 1,p.78) and for cotton spinning and weaving (Ref. 2,p.168) provide clear illustrations.

It should be noted that n^*m, the size of the oligopoly group as defined by the first minimum of the Linda index may often correspond with i^* - the definition of the "sub-group with abnormal power" in Linda's original 1967 presentation.

Let us take again the two distributions analysed in Table IV-1:-

Series A:- 1000, 800, 640, 512, 409.6

Series B:- 1000, 800, 300, 240, 192

Linda indices for these distributions are presented in Table IV-3

Table IV-3 Linda indices for Series A and B

n*	Linda index (A)	Linda index (B)
2	0.6250	0.6250
3	0.4659	0.8030
4	0.3907	0.7074
5	0.3495	0.6294

The value of L_2 is a minimum in the sense that it is followed by a higher value.* It shows an oligopolistic arena of two. This was previously indicated by M (See Table V-I), now omitted from Linda's methodology.

2. Linda indices in the four Cranfield projects

(a) Paper manufacture and conversion

In neither of these broad industry classes was there a minimum point for n* less than 40 in the Linda curves for sales turnover, in any of the five years analysed. This is because there was no marked discontinuity in the concentration ratios. Yet these were concentrated industries: the four-firm concentration ratios in 1968 were 50.6 and 54.9 respectively. No distinct group of large firms was identified, within which firms might consider each other as competitors while being able to ignore the "fringes" beyond. (Linda's terminology). If oligopoly signifies the existence of such a group then no oligopoly existed.

Within product groups, "oligopolistic arenas" were identified in most cases, reflecting specialisation by some of the larger firms. Results are summarised in Table IV-4, for 1968 and 1972.

Table IV-4 Paper industry study - Minimum Values of Linda Curves

	1968			1972		
	n*m	Cn*m	Ln*m	n*m	Cn*m	Ln*m
Manufacture						
Printing & writing	4	70	0.58	3	58	0.82
Packaging paper	6	88	0.73	5	85	0.72
Board	3	76	0.80	3	71	0.62
Conversion						
Stationery	2	84	1.17	2	83	1.55
Packaging (not board)	2	57	0.86	2	57	0.94
Board packaging	no minimum n* less than 90					

* The interpretation problems arising when n* = 2 are discussed in sub-section 3.

These results show that the definition of the oligopoly group is not much influenced by the combined concentration ratio - the major determinant is the discontinuity.

(b) Textiles

At the time of the textiles study there was increasing interest among institutions working for the Commission in this phenomenon of the oligopoly group. A summary table in the textiles report (Ref. 2 p.70) reveals a number of interesting problems in the application of the concept.

The results show the existence of an oligopoly in the combination of the three sub-sections - cotton, wool and hosiery. In 1968-70 five firms (Courtaulds, Coats, Tootal, Carrington and Dewhurst and Viyella) formed an oligopoly. In 1971 the merging of the last two companies resulted in a reduction of the oligopoly to four firms but the expansion of Illingworth Morris brought it within the "oligopolistic arena" as defined by the Linda index in 1972. The statistical analysis here confirms common observation - this group of large firms with widespread textile interests stands apart from other organisations which specialise in one or more sub-sectors of the industry.

Within these sub-sectors the definition of oligopoly varies erratically. In wool the Linda analysis showed an oligopoly of six firms in 1968 with a combined share of sales turnover of 48 per cent; from 1969 to 1971 no similar small group was identified - but concentration had not diminished. Minor changes in shares had led to the disappearance of the Linda minimum; in 1972 and 1973 it returned, to indicate a duopoly. In cotton, the oligopoly similarly disappeared in 1973 though changes in concentration ratios were negligible. In hosiery an oligopoly was identified in 1968 (seven firms), 1969 (eight firms) and 1973 (eight); in the intervening years no group was identified.

The apparent inconsistency of the definition reflects the existence of a critical degree of discontinuity in concentration ratios. If that critical degree is exceeded, however slightly, a minimum value of L occurs; if it is not reached, by however small a margin, no minimum occurs. This is explained further in the next sub-section.

(c) Vehicle accessories (tyres, spark plugs and accumulators)

This report concerned oligopolies since only large firms are involved in the high volume supply of the products. The Linda index showed minimum values within the sample for the last two years of the data for tyres and this lent statistical support to the view that the three largest firms were emerging as distinctly powerful competitors within the group of six. With batteries and spark plugs also, for which the indices were based on market shares the Linda analysis confirmed expectations based

on qualitative information.

(d) Publishing

For publishing as a whole the Linda index for sales turnover showed a group of seven companies as an oligopoly from 1968 to 1973. In 1974 this distinction disappeared but reappeared in 1975 although the "oligopolistic arena" now contained only six contenders (Ref. 4 pp. 20-1).

The Press is more concentrated than general publishing but, the Linda index for sales turnover reached minimum values in 1968, 1973 and 1975 at seven, ten and seven firms. The concentration ratios for these groups were very high - 77, 78 and 70 per cent. One might have expected smaller groups to be defined - although the importance of classified advertising for firms outside the large-circulation "giants" brings their sales revenue sufficiently close to that of these large firms to prevent the occurrence of a substantial discontinuity. When the statistical analysis is applied to circulation (ibid. p.85) oligopolies of four firms in 1968 and five in 1975 are identified - News International joining at the latter date the four earlier contenders: Reed, Beaverbrook, Daily Mail and Thomson.

The absence of an oligopoly in the supply of school text-books is apparent from the results of our survey and, once again, the Linda index confirmed expectations.

3. Some experimental tests of the Linda minimum and consequent conclusions

The summary of the results from the four Cranfield reports of the application of the Linda index to sales turnover demonstrated that, in general, the minimum point identified a recognisable oligopoly. The index itself or rather (L_{n*m} - 1/n*m) can then be used to describe inequality within that group.

(a) One difficulty, particularly evident in the textiles report, is that the existence of a minimum depends on the degree of discontinuity in size. That degree is a continuous variable but once a threshold level is exceeded a discrete change in n*m occurs. As already emphasised, the critical point can be identified only by iteration and defined only by example.

Let us consider two distributions of ten values:-

Series C: 1000, 800, 640, 512, and six values of 323.
and
Series D: 1000, 800, 640, 512 and six values of 324.

The total of Series C is 4890 and that of Series D is 4896. For the two distributions, the Linda coefficients and concentration ratios are as follows:-

Table IV-5 Concentration ratios and Linda Indices for above Distributions

	Series C		Series D	
n*	C	L	CR	L
1	20.45	-	20.43	-
2	36.81	0.6250	36.77	0.6250
3	49.90	0.4659	49.84	0.4659
4	60.37	0.3907	60.29	0.3907
5	66.97	0.3911	66.91	0.3905
6	73.58	0.3449	73.53	0.3442
7	80.18	0.2986	80.15	0.2980
8	86.79	0.2594	86.77	0.2588
9	93.40	0.2272	93.38	0.2267
10	(100)	0.2209	100	0.2005

For Series C the Linda index has a minimum at n* = 4 suggesting an oligopoly of four firms; for Series D no minimum is indicated. The distinction appears to be arbitrary: the difference between the two distributions can have no economic significance. It is clearly within the range of errors in data collection.

Although this is a hypothetical example, one must emphasise that a dividing line of the kind shown in Table IV-5 was crossed between successive years in the textiles study. Tables 24 of the textiles report (Ref. 2 p. 70) shows that a boundary of this kind was crossed on six occasions - revealed by big changes in the number of "oligopolists". One refinement of the application of the Linda index would be some assessment of the degree of discontinuity - how distinct is the oligopoly? A refinement proposed by another researcher, working on similar contracts in Germany, is described in the next section. This refinement does not overcome the criticism that no oligopoly at all is identified for Series D - it is the discrete, "yes/no" conclusion of the analysis which gives ground for concern.

(b) In his presentation of the index in both the 1972 article (Ref. 37) and the 1976 Methodology document (Ref. 39), Linda illustrates the minimum by using a series where $x_i = x_{i-1}/k$ where $k > 1$.

For example a series where k = 2 might be as follows:-

100, 50, 25, 12.5 etc.

Contrary to my own expectations (even in this case the use of calculus appears abortive), the Linda index for this series has a minimum at n* = 3. In an attempt to arrive at some means of mathematical determination of such minima, the calculation of Linda indices was applied to series of this form with values of k ranging from 1.2 to 4.0. The results are presented in Table IV-6; each series consisted of 30 observations.

Table IV-6 First minima of Linda functions with constant ratios

Ratio constant (k)	n*m	Ln*m	CR
1.2	11	0.2487	88.9
1.4	6	0.4587	86.8
1.6	4	0.6411	84.7
1.8	3	0.8057	82.9
2.0	3	0.9444	87.5
3.0	2	1.5000	88.9
4.0	2	2.0000	93.8

Table IV-6 shows very little - there is no apparent functional relationship between k and n*m. One conclusion which does emerge is that for high values of k, n*m = 2. By chance, an ambiguity has been identified. Since with k = 4 the first firm is four times the size of the second and has 75 per cent of the total market (0.8 times 93.8), one might conclude that here was a monopoly rather than a duopoly. When n*m = 2 the Linda minimum is ambiguous; the absolute value of L must be used to determine whether the situation is one of balanced duopoly or monopoly.

(c) A third test was the application of the Linda analysis to 99 values of e^x, where x is normally distributed with a mean of 2.0. Table IV-7 shows the results of this test. The conclusion is that unless the distribution of logarithms has a standard deviation more than double its mean there is no Linda minimum at values of n* less than 10 per cent of the total sample. At the point where s = 4.0, the concentration ratio for the 10 per cent of firms would be 99.5 and the Gini coefficient much closer to unity than has been observed in any of our own studies.

The existence of a minimum value of the Linda index at small values of n* appears to contradict the lognormal hypothesis. The fact that the test is applied in practice only to the upper tail of the distribution does not invalidate it. This preliminary conclusion requires further research, for example into the standard error of the Linda coefficient but it is of some relevance to the arguments concerning the existence of the lognormal distribution.

Table IV-7 The Lognormal distribution and the Linda Analysis

S	Gini	n*m	Ln*m	CR
1.0	0.527	80	0.0570	96.9
2.0	0.862	52	0.3532	98.3
3.0	0.966	26	2.3272	99.2
4.0	0.985	10	12.1103	99.5
5.0	0.989	6	46.1878	99.8

Note: S = standard deviation of x, which has a mean of 2.0 coefficients are derived from distribution of e^x.

E. PROPOSED CHANGES IN THE APPLICATION OF THE LINDA INDEX

Following discussions with representatives of some of the research organisations working on this series of studies, including Professor Fleischmann of the University of Frankfurt, the Market Structure Division of the Directorate General for Competition now proposes to amend the existing methodology. These proposals have been presented verbally only within the few days before the writing of this report; because they relate to basic principles and substantially change the application of the Linda index, they are summarised here.

1. Redefinition of the Linda minimum

Because two firms may form an oligopolistic arena the formal definition of a minimum has been changed to the first value of n* for which the Linda index is lower than that for n* + 1. This means that n* = 2 can define the oligopoly. In the Cranfield reports, we have anticipated this change because the previous formal definition by the Commission:-

$$L_{n*m-1} > L_{n*m} < L_{n*m+1} \quad \text{(Ref. 39, p. 19)}$$

rules out the possibility of oligopoly with two contenders (duopoly).

Instances of duopoly are quoted for manufactured stationery and non-board packaging in the paper study, for woollen textiles in 1972 and 1973 and for motor vehicle batteries in 1975. The change in the formal definition is necessary but there remains the need to refer to the absolute size of L_2 in order to identify whether one of the two firms in the "oligopolistic arena" may be dominant (see previous section, p. 81).

2. The degree of oligopoly

An oligopoly is identified whenever a discontinuity in the sequence of concentration ratios is sufficient to cause a minimum point of the Linda curve. The degree of isolation of the oligopolistic group from competition by other firms depends upon the degree of discontinuity.

A numerical measurement of this degree of discontinuity (so far described only by a French title - "degre de rupture") has been suggested by Fleischmann. It is as follows:-

$$100\ \frac{(L_{n^*m+k} - L_{n^*m})}{L_{n^*m}}$$ where L_{n^*m+k} is the first maximum value of L

beyond the first minimum value, k denoting the difference between the value of n* at which this maximum occurs and n*m. By "maximum" is meant any value of L_{n^*} such that

$$L_{n^*-1} < L_{n^*} > L_{n^*+1}$$

The calculation and apparent validity of this concept may be illustrated by data from the publishing study. In Table IV-2 above I showed that the Linda index identified an "oligopolistic arena" in the distribution of sales revenue (from all sources) in publishing in 1975, this arena consisted of six firms.

The analysis of newspaper circulation in London and South-East England (copies sold per week) showed an oligopoly of four firms which was much more distinct. Table IV-9 and Figure IV-3 show these two applications.

Table IV-9 Definition of Oligopoly in U.K. Publishing Turnover and in Newspaper Circulation in South-East England 1975

U.K. PUBLISHING TURNOVER			NEWSPAPER CIRCULATION		
i/n*	Share of firm i(%)	Linda coefficient	1/n*	Share of firm i(%)	Linda coefficient
1	18.9	-	1	23.3	-
2	10.0	0.861	2	19.7	0.593
3	9.1	0.586	3	18.6	0.397
4	6.1	0.522	4	15.9	0.319
5	5.9	0.428	5	6.0	0.414
6	5.9	0.352	6	5.6	0.408
7	3.4	0.355	7	2.9	0.474

Table IV-9 (continued)

8	2.9	0.339	8	2.1	0.524
9	2.4	0.336	9	1.9	0.540
10	2.3	0.321	10	1.2	0.593

It is clear from the graph and from the table that a minimum occurs in the Linda coefficient when there is a pronounced decrease in the ratio of the size of firm i to that of firm i - 1. For U.K. publishing turnover as a whole, such a decrease occurs at i = 7, and this step decrease generates a Linda minimum at n* = 6. The step is not a very large one - the series of ratios is 0.53, 0.91, 0.67, 0.97, 0.98, 0.57. For newspaper circulation the corresponding series is 0.85, 0.94, 0.85, 0.38 - a much more pronounced step.

For U.K. publishing turnover the "degré de rupture" as defined above is

$$100\left(\frac{0.355 - 0.352}{0.352}\right) = 0.85 \text{ per cent}$$

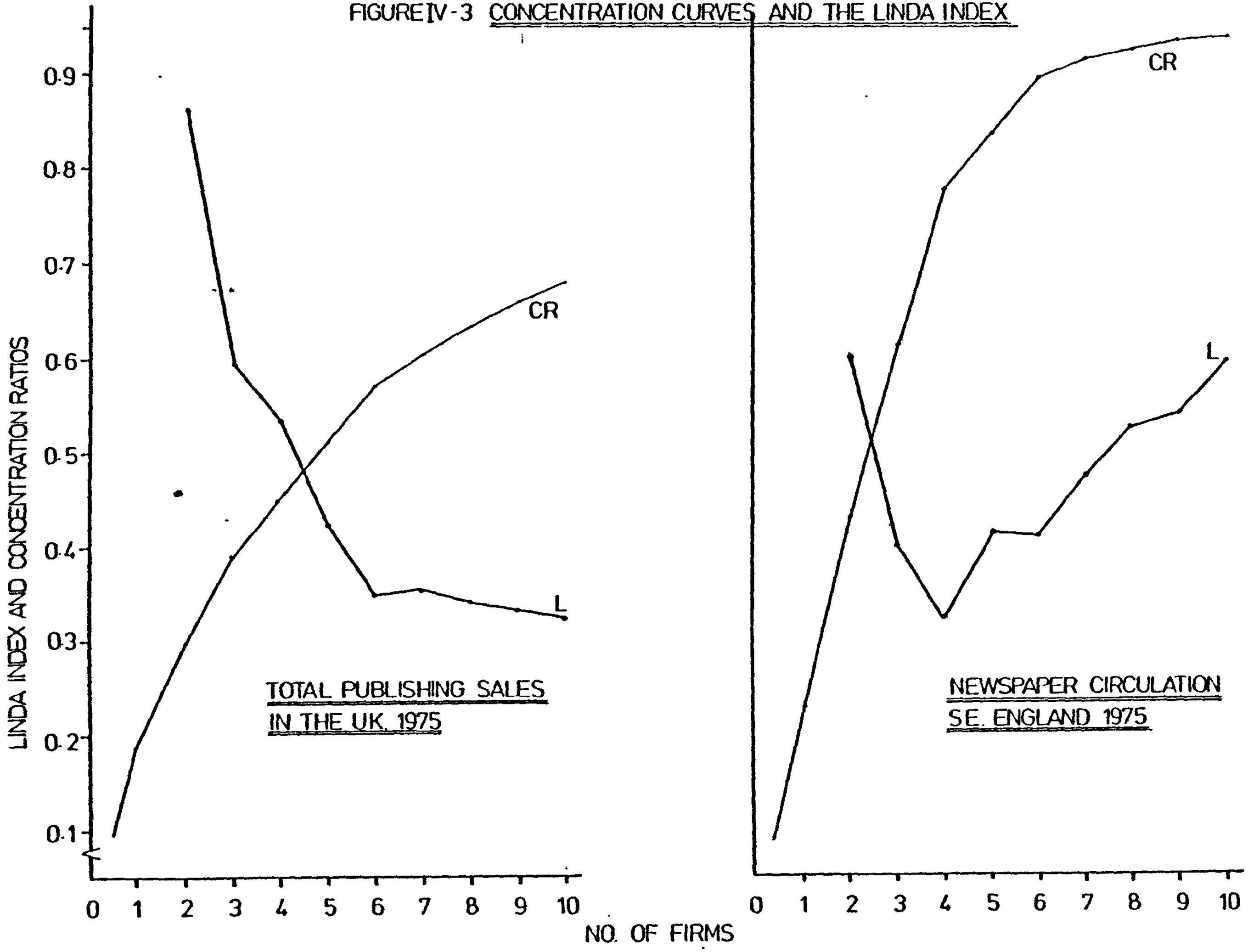
For newspaper circulation in S.E. England it is

$$100\left(\frac{0.414 - 0.319}{0.319}\right) = 29.8 \text{ per cent}$$

Since the existence of an "oligopolistic arena" is determined by a somewhat arbitrary dividing line, a measure of the degree to which that dividing line is exceeded appears to be a valuable addition to the Linda methodology.

The "degré de rupture", since it measures the degree of isolation of the oligopolist from the other firms in the industry may also be positively associated with the incentive for these companies to collude or to agree to a detente on competition. This measure appears more flexible than the "coalition potential" suggested by Miller (Ref. 47) and given that title by Vanlommel et al (Ref. 57). This latter measure is $(C_8 - C_4)$ or, as transformed by the Belgian authors $(C_8 - C_4)/C_4$. The main weakness of this measure is the arbitrary choice of four and eight-firm concentration ratios. This reflects convenience for use of U.S. statistics and has no theoretical basis.

FIGURE IV-3 CONCENTRATION CURVES AND THE LINDA INDEX



3. The degree of inequality within the oligopolistic arena

In the proposals now under consideration this would be measured by

$$L_{n*m} - 1/n*m$$

This measure follows the suggestion of Morvan (Ref. 44) except that the oligopolistic arena is now defined by the first minimum of the Linda index. This adjustment enables one to compare relative strengths within oligopoly groups. For example in 1968 in the production of packaging paper an oligopoly group of six firms was identified with a Linda coefficient of 0.73; in the production of packaging using such paper a duopoly was indicated with a Linda coefficient of 0.86.

The degree of inequality in these two cases would be measured in the new methodology as 0.56 (that is 0.73-0.17) and 0.36 (that is 0.86-0.50).

4. Consequent changes in the Linda methodology

The implementation of these proposals will mean major changes in the presentation of results. In particular L_{n*h} (the first maximum of the Linda index) will cease to be important as such, though L_2 which describes the relation between the sizes of the largest firms) will continue to be noted. The first "matrix of oligopolistic interdependence" will be redesigned with probably reduced emphasis also on L_s. Because these changes will be so extensive and because they result in part from my own criticism, I have not described the first matrix of oligopolistic interdependence in this summary. In the form in which it appears in the vehicle accessories and publishing reports I believe it adds little to the analysis but is very complex and would require lengthy explanation.

F. THE DEGREE OF DYNAMISM

It has already been stressed in Chapter One that Linda does not regard the existence of oligopoly or inequality within oligopoly as diminished competition nor does he consider that these features as such should be grounds for public concern. Such public concern should be arounsed when an oligopoly is also accompanied by rigidity: evidence of competition is to be found in changes in market share.

An index of dynamism is defined by Linda (Ref. 39, p.73) as

$$d = \frac{1}{2} \sum_{i=1}^{n*} \left| P_{it} - P_{it-1} \right|$$

where $p_i = x_i / \Sigma x_i$ and the two vertical lines indicate the use of absolute value.

The maximum of this index is 1.00 or 100 per cent and the minimum 0. The index of dynamism was introduced to the methodology only in 1976 and appears only in the vehicle accessories and publishing reports (Ref. 3, pp. 68-9) and Ref. 4 p. 21).

This summary measure can be similar for many different kinds of changes. In particular it does not distinguish between increases and decreases in concentration. Let us compare the structures of publishing and tyres in the United Kingdom in 1970 and 1974, confining the analysis to the six largest publishing firms (which formed an oligopoly in 1975).

Table V-10 Dynamism among Six Largest Firms in Tyres (U.K.) and Publishing 1970-5

	Tyres - market share			Publishing-share of total of 6		
Firm	1970	1975	Change	1970	1975	Change
1	46.46	43.51	-2.95	41.34	33.22	-8.12
2	16.37	14.58	-1.79	16.50	19.33	+2.83
3	15.69	24.18	+8.49	11.93	10.37	-1.56
4	8.11	6.95	-1.16	11.60	10.72	-0.88
5	7.18	6.06	-1.12	10.95	15.99	+5.04
6	6.19	4.72	-1.47	8.00	10.37	+2.37
	Absolute change		16.98	Absolute change		20.80
	Dynamism index		8.49%	Dynamism		10.40%
		or	0.085		or	0.104

In the tyres industry the dynamism was due to increased market share obtained by one firm (Michelin) obtained through aggressive marketing policies; in publishing the changes were more complex.

Linda himself admitted the limitations of this measure, (or, more precisely a derivative of it which is now no longer part of the methodology) in his 1972 article (Ref. 37, p.401). However he emphasised that a low value of the dynamism index, implying rigidity of market shares, should attract the attention of those authorities concerned with maintenance of competition. Such a value implied either

(a) An absence of competition due to collusion or inert coexistence or

(b) Competitive strategies were mutually compensating.

The second case might be one of wasteful competition, which itself might merit investigation.

In his 1972 article (Ref. 37) Linda suggested that the index of dynamism might also be calculated for firms within the oligopoly. One problem here is the changing definition of that group but, in principle, the suggestion appears to have merit, though it is not applied in the current methodology.

G. AN EVALUATION OF THE LINDA METHODOLOGY

1. General Comments

In Section B of this chapter were considered some of the earlier attempts to measure inequality within an oligopoly. The main defect of these measures was their inability to reflect any discontinuity in the size-distribution of the largest firms - that is their failure to define and therefore to analyse specifically the oligopoly group.

The Linda index is not based (since 1972) on a preconceived definition of oligopoly, e.g. the first r firms or the number of firms accounting for x per cent of the market. It enables the researcher to identify the "oligopolistic arena" and to study inequality within it. The proposed changes described in Section E should be the final stage in the perfection of the system of indices, which has evolved through empirical work over the past ten years.

The main weakness of the index remains its complexity. Because mathematical analysis can be undertaken only by iterative computation, the behaviour of the index under different conditions can be determined only by this same means - trial and error. Unfortunately the range of conditions is almost infinite.

A particular problem arises with the occurrence of minimum values of the index, which are the criteria for definition of the oligopolistic arenas. This fine dividing line illustrated by hypothetical example and by reference to the results of the textiles and publishing studies creates difficulties of interpretation. Measurement of the degree of discontinuity will enable future research teams to quantify the degree of separation of the oligopoly group when such a group is identified. Cases where a Linda minimum only just fails to occur will remain ignored - not enough empirical work may yet have been completed for this yes/no criterion to be firmly accepted.

The index of dynamism is more comprehensible than the Linda index. The reasoning which underlies it appears logical and has intuitive appeal. It would be interesting to use this index as an independent variable in statistical studies like some of those described in Chapter One which seek to explain variations in company profits.

2. Refinements appearing in the later reports (The three matrices)

The first "matrix of oligopolistic interdependence" based on

combinations of parameters derived from the Linda curves is likely to be discontinued. This matrix presents the rankings of different variables according to these parameters (L_s and L_{n*h}). The parameters themselves have been questioned by those working for the Commission and comparison of Linda indices for different variables is, in my view, of doubtful validity. This is discussed in the next sub-section.

The second matrix of oligopolistic interdependence is based on rankings of firms according to two performance ratios:

$$\frac{\text{net profit before tax}}{\text{sales}} \quad \text{and} \quad \frac{\text{net profit before tax}}{\text{equity}}$$

These rankings are compared with ranking by turnover and profit. My own view is that these and many relationships are better examined by more conventional statistical methods, particularly regression analysis and rank correlation. This latter approach was adopted in all four studies, with no significant results and was discussed on page 13 above.

The third matrix is a comparison of the degree of dynamism in sales turnover and profits. Again, I believe such comparisons to be of dubious validity for reasons explained in the next sub-section.

3. Application of Linda analysis to different variables

One application of the system of Linda indices and the index of dynamism has been to comparison of inequality and change in different variables. Linda himself has presented such analyses relating to Italian industry (Ref. 80, summarised in Ref. 39 pp. 44-5 and 74-5). The main conclusion of these studies has been that profits have been both less evenly distributed among firms and more volatile.

There are some statistical problems in some of these comparisons which result from the differences in ranking of firms according to the two variables. These are identified in Appendix B of the paper study (Ref. 1). An equally important point is that unless revenue (R) and costs (C) are perfectly and linearly correlated then the degree of relative inequality in (R-C) must be greater than that in R. The statistical proof of this on pp. 39-41 seems to invalidate conclusions based on comparison of Linda indices for different variables.

A similar comment may be applied to the index of dynamism. If both R and C are subject to random fluctuations then the relative degree of fluctuation in (R-C) will be greater than that in R. The statistical proof of this can be derived from that on p. 39.

4. A final comment on these observations

It should be emphasised that all of these observations have been discussed with Dr. Linda and his colleagues in the Directorate-General for Competition. The Commission's representatives have welcomed such observations from research teams and appear to regard them as a necessary element in the continuing refinement of the methods adopted for analysis of concentration.

CHAPTER FIVE: SOME CONCLUSIONS ABOUT THE VALUE AND DIRECTION OF THE RESEARCH

For this chapter I have not attempted a comprehensive survey of all the studies in sectoral concentration completed in this series for the Commission of the European Communities. Such a survey would undoubtedly be useful but would also be a lengthy task, since the total number of reports published exceeds 100, most of which are in languages other than English. This examination in the four previous chapters of the objectives and methodology of the studies makes it possible to draw some tentative conclusions about the potential value of the entire series.

A. TOTAL COSTS OF THE RESEARCH

From the beginning of the studies in 1970 and the end of 1977, total expenditure by the Commission on this programme of research was 56.9 million Belgian francs. In order to interpret this figure it is necessary to adjust each year's expenditure for inflation and to apply average exchange rates. Since exchange rates do not reflect purchasing power parities and since all nine E.E.C. member countries are involved, the calculation can only be approximate. The cost in pounds at December 1977 U.K. purchasing power of expenditure in year t was calculated as follows:-

$$\frac{\text{Expenditure in t (B.frs.)}}{\text{Average exchange rate in t (B.frs. per £)}} \times \frac{\text{U.K. retail price index Dec. 1977}}{\text{" " " " year t}}$$

Table V-1 shows the result of this calculation.

Table V-1 Costs of the Studies in Industrial Concentration

	Actual expenditure*	Sterling equiv. at Dec. 1977 prices
	000 B. Frs.	£000
1970	2,600	56.4
1971	3,870	76.8
1972	4,350	86.9
1973	4,750	100.1
1974	8,235	156.9
1975	7,420	126.9
1976	15,724	270.4
1977	9,998	165.5
	56,946	1039.9

* Source: Data supplied by Directorate General for Competition

These figures of costs refer only to the values of contracts placed with universities and other research organisations. They do not include any proportion of the salaries of those staff of the Commission whose time is partly devoted to coordination of the studies, nor certain direct expenses such as computing in Luxembourg and costs of travel by the Commission's staff. The total of these excluded expenses probably has not exceeded £200,000 at December 1977 prices. This would bring the total cost of about £1.2 millions.

It may be argued that some of the studies have made a financial contribution to the research organisations which have undertaken them and the figure of just over £1 million shown in Table V-1 is an overestimate of social opportunity cost. The last figure is difficult to quantify. The four Cranfield studies resulted in a surplus over direct expenses (excluding the value of the time of permanent staff) which amounted to over 35 per cent of the contract prices. However, the required involvement of the School's academic staff was such as to retard other research and to require colleagues to undertake additional teaching. The contract prices were at the minimum level for the School's acceptance of the work and in Cranfield's case do represent opportunity costs. It seems reasonable to assume that similar arguments apply to other research groups.

B. THE METHODOLOGY IN RELATION TO THE PURPOSES OF THE STUDIES

In his paper to the Bruges Conference in 1977 (Ref. 79, pp. 51-2) Linda emphasised the importance of the concentration studies as a means of providing a "reasoned and systematic stock of specific and concrete information". This information will be used within a "philosophy of active prediction". I interpret these and further remarks by Linda to mean that the results indicate to the Directorate General for Competition those industries or product markets in which competition is not functioning satisfactorily and the conditions covered by Articles 85 and 86 of the Treaty of Rome may occur.

This principle - that the major purposes of the studies is the collection and analysis of facts about concentration, to provide an empirical basis for policy, was emphasised in Chapter One of this summary report. It was also pointed out that dominance over a market is difficult to define or measure but that concentration is only one aspect of it. Traditional analysis, which is based on departures from perfect competition, is regarded by some economists as inappropriate for measurement of dominance in an oligopolistic environment.

The methodology prescribed by the Commission consists of two elements:-

(1) A series of indices based on the entire sample of firms included in each study. In Chapter Three the difficulties in interpretation of such indices were described; no single summary index appears to be satisfactory, though the entropy measure appears to merit further consideration.

(2) A new framework for the statistical analysis of oligopoly. This is based on the Linda index, which measures oligopolistic interdependence and inequality and on measurements of stability of market shares. This new framework, which is still evolving, might well fill a gap in the methods available for analysis of oligopoly but problems remain - in particular the discrete line of demarcation used to define the existence of an oligopoly.

At several points in this report I have emphasised that one should not compare indices of concentration for size and performance variables. Such are comparisons, in my view, a weakness of the existing methodology of the Commission. This same comment has been made in each of the four reports.

This last comment relates to the principles of analysis. The more substantial weaknesses in the reports which we have produced arise not from defective methods of analysis but from the more practical problems described in Chapter Two. These include the definitions of industries or product-markets; the fact that most of the tabulations and statistical analysis ignore the competition of imports; the definitions of firms and the arbitrary rules for inclusion of companies within the sample to be analysed; the treatment of inter-company links. The enterprise analysis for textiles which excludes Courtaulds or that for publishing which excludes Reed - how can either be of use in the formulation of economic policy? How can one be sure that the extensive holdings of the equity of "competitors" in the publishing industry will be borne in mind when summary statistics from studies in member countries are compared? How can an "oligopoly" be said to exist in either paper manufacture or textiles when import penetration of the U.K. market is around 50 per cent? These points are so prosaic, so elementary that they may seem out of place here - but such criticisms undermine the credibility of the statistical results of much of our work and, by implication, those of other studies in this series.

C. SOME TENTATIVE SUGGESTIONS

1. Despite its complexity and certain difficulties of interpretation, the framework recommended by the Commission for analysis of oligopoly appears to be very relevant to the identification of absence of competition and, "dominance", either by one firm or by a non-competing group. Further research into its validity and applicability to the objectives of anti-trust policy should continue.

2. <u>The studies should be directed more towards the product market rather than the industry</u> and the major variables for analysis should be sales turnover (in money terms) and, if possible, sales volume. Analysis of other variables including performance-related measurements should be contained in the projects but the identification of dominance should be based essentially on the market and the calculation of concentration indices should be confined to market data. This concentration on the market is closely related to Article 86 of the Treaty of Rome.

With market-share as the principal variable, the inclusion of

individual firms in the analysis need be determined only by the importance of their market share. It is obvious that the total size of a firm affects its ability to compete in any single market and the studies should continue to include analysis of financial variables relating to the total activities of firms with significant market shares. However, this analysis might usefully be less quantitative, since the need to adhere to a statistical framework imposes unnecessary rigidity upon it.

The use of market-share as a starting point for the analysis would also enable the research organisations to incorporate imports into the concentration indices. The influence of imports on the existence of a "dominant position" cannot be ignored and, although the Commission's methodology requires reference to the level of imports, the tables of concentration indices would be more useful if imports were included quantitatively.

This suggestion implies much more work in data collection. Estimates of market share might be available from market research agencies, such as those by the Economist Intelligence Unit Ltd., Mintel McClaren and the Joint Industry Committee for National Readership Surveys, from which we have drawn in our reports. Otherwise data on market shares might need to be obtained by direct inquiry, carried out by the research institution or wholly or partly sub-contracted. A major problem might be the compilation of comparative data for earlier years. This might not be insuperable: with the latest year as a guide, it might be possible to derive acceptable estimates from a variety of sources for earlier years - company accounts, Business Statistics office and trade association data, foreign trade statistics and any earlier market research inquiries.

3. <u>More analysis of actual competition</u> is required. Linda himself has acknowledged that rigidity of market shares could reflect compensatory competitive strategies by the companies concerned. His view that such competition may be wasteful and may require investigation is reasonable but one can argue that such investigation should form an integral part of these studies. In the vehicle accessories study, advertising expenditure was analysed, for this, fairly reliable data are available. It would be useful to add to the studies examination of price policies and methods of distribution. The influence of vertical integration or of monopsonistic buying power on competition might also be a useful topic for study.

4. <u>Analysis of profits and performance in relation to concentration</u> is subject to numerous difficulties described in Chapter One. The Commission is interested in the abuse of dominant positions but this cannot in my view be identified by comparison of concentration ratios for size and profit variables.

The conceptual difficulties surrounding statistical inquiries into the effects of concentration on company behaviour, reflected in profits, wages or discretionary expenditure are very great. Much of the work undertaken by economists in recent years in this field has been devoted to unacceptably simple hypotheses. Although the Commission's work may provide a useful source of data for European studies of this kind, much preparatory work is needed before extensive statistical investigations can begin.

D. A GENERAL CONCLUSION

Market dominance is something that many people understand without being able to design a formula for its measurement. The Commission's emphasis on inequality within oligopoly groups and on rigidity of market structure as indications of the possible existence of dominance is consistent with the views of most economists who have stressed the importance of competition among the few. The principal weaknesses of the studies as at present designed originate ultimately from the imposition of a rigid statistical framework - from excessive reliance upon quantification.

This overemphasis on consistent statistical analysis requires the use of consistent criteria for inclusion of firms in samples, for definition of industries and of variables but this consistency equates to inflexibility and results occasionally in nonsensical anomalies. It also implies a degree of quality and reliability in figures which those who compile them would not wish to see implied. This reliance on standard quantification means that effort is devoted to the computation of indices, to ratio analysis or to regression analysis which could more usefully be devoted to research into the competitive process. These other aspects, described in the tentative suggestions above, still require quantitative investigation, but the methods of inquiry would be adapted to the particular topic.

The Commission wishes to compare results from different industries and different countries. Some standard output is necessary but at present this is given so much emphasis that the value of the reports in the formulation of public policy must be open to serious question.

On page 92 above the total expenditure at December 1977 prices on projects then completed or in course of completion was estimated at about £1.2 millions. Whether the total value of the information reported will exceed this figure is open to question.

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COMMISSION OF THE EUROPEAN COMMUNITIES

DIRECTORATE-GENERAL COMPETITION
IV/A-3

A STUDY OF THE EVOLUTION OF CONCENTRATION IN THE UNITED KINGDOM PAPER INDUSTRY

Vol. 2.

P R E F A C E

The present volume is part of a series of sectoral studies on the evolution of concentration in the member states of the European Community.

These reports were compiled by the different national Institutes and experts, engaged by the Commission to effect the study programme in question.

Regarding the specific and general interest of these reports and the responsibility taken by the Commission with regard to the European Parliament, they are published wholly in the original version.

The Commission refrains from commenting, only stating that the responsibility for the data and opinions appearing in the reports, rests solely with the Institute or the expert who is the author.

Other reports on the sectoral programme will be published by the Commission as soon as they are received.

The Commission will also publish a series of documents and tables of syntheses, allowing for international comparisons on the evolution of concentration in the different member states of the Community.

CRANFIELD SCHOOL OF MANAGEMENT

STUDIES IN INDUSTRIAL CONCENTRATION

Director of Projects: R. B. Cornu
Technical Consultant: F. Fishwick

No. 1: CONCENTRATION IN THE UK PAPER INDUSTRY 1968-1972

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Contents

		Page
	Acknowledgements	1
	Introduction	2
	Summary	3
Section 1.	Research Methodology	5
	A. Basis of Classification	7
	1. Classification of firms within the industry	7
	2. Classification on the basis of output	8
	3. Classification on the basis of ownership	9
	4. Classification problems in respect of vertical integration	9
	5. Classification according to product groups	9
	B. Industrial Concentration and its Measurement	11
	1. Definitions and basic properties of concentration	12
	2. The measurement of fewness	19
	3. The measurement of dispersion	21
Section 2.	Manufacture and Conversion of Paper and Board	24
	1. Vertical integration within the industry	30
	2. Diversification by enterprises	31
	3. Summary of industry structure	32
	4. Employment within the industry	34
	5. The analysis of concentration	35
	6. The test for lognormality	51
	7. The pattern of ownership	53
Section 3.	Analysis of Manufacturing Product Groups	55
	1. Manufacture of printing and writing paper product group	64
	2. Manufacture of packaging papers product group	72
	3. Manufacture of board product group	79
Section 4.	Analysis of Converting Product Groups	87
	1. Manufactured Stationery product group	96
	2. Non-board packaging product group	102
	3. Board packaging product group	110
	4. Miscellaneous converted products group	119
	5. Wallcoverings product group	124

		Page
Appendix A:	Comparison of Concentration Indices for all financial variables relating to organisations in Manufacturing and Converting Sectors of the Industry	126
Appendix B:	Technical Note: Comparison of Concentration of Financial Variables - the Effects of Different Ranking	131
Appendix C:	External Trade in Manufactured and Converted Products:	134
	(a) Imports & Exports by origins and destinations;	134/5
	(b) Balance of Trade with EEC	136
Appendix D:	Company Profiles:	137
	Reed International Ltd.	138
	The Dickinson Robinson Group Ltd.	141
	Wiggins Teape Ltd.	144
	The Bowater Corporation	146
Appendix E:	Official Government Indices of Wholesale Prices - Commodities Produced in the UK	148
Bibliography		149

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However, full responsibility for analyses and opinions expressed within the Report rests with the authors.

January 1975

INTRODUCTION

This Report describes an investigation of the industrial concentration within the UK Paper Industry, 1968-1972. The study was sponsored by the European Economic Commission and was of approximately nine months' duration.

The research constitutes one part of a series of studies of the development of concentration in selected sectors and markets of EEC member countries.

The terms of reference for the study covered the following industrial sectors:

Manufacture of Paper & Board (NICE 271) (S.I.C. 481)
Conversion of Paper & Board (NICE 272) (S.I.C. 482-484 incl.)

The analysis of these industrial sectors covered both quantitative and qualitative aspects.

For the quantitative analysis, the Directorate of Competition of the EEC specified a number of indices which have been used in similar studies throughout the Community. These indices and the research methodology are described in Section 1 of the Report.

SUMMARY

The study has confirmed theoretical objections to the use of concentration indices to describe structure and performance in a market. The sectors investigated were defined by the nature of the raw materials rather than the purposes of the finished products. When applied to whole industrial sectors so delineated, measures of concentration do not reflect competition from substitute products made in other industries (for example, between paper and polythene bags, or paper towels and textile towelling); neither do they reflect competition from imports; finally, their use as a measure of competition implies that all products within the sector are competitive with each other (in an extreme case, cardboard boxes are competitive with paper handkerchiefs!).

Within the paper industry all three of these objections were found to be valid. Many products have close non-paper substitutes; imports account for about half of total UK paper consumption, and for significant proportions of that of certain converted products; within each of the major sectors of paper and board manufacture and conversion, there exist separate and identifiable product groupings.

It was considered that a more meaningful description of competitive forces would be achieved by individual analysis of each product group. Greater emphasis was therefore given to analysis of product groups than to statistical information relating to the complete sectors. Sections 3 and 4 of the report describe for each of the eight product groups the relative sizes of the major companies, the pattern of overseas trade, and the forms of competition (pricing, distribution and other marketing aspects). The diversity of the industry and of the markets which it supplies are major conclusions of this analysis.

The product groups analysed were as follows:

Paper & Board Manufacturing: Printing & Writing Paper
Packaging Paper including Tissues
Board including Corrugated Case Materials

Paper & Board Conversion: Non-Board Packaging (bags and multi-wall sacks);
Board Packaging (cartons and fibreboard containers)
Manufactured Stationery
Miscellaneous products (cups, plates, fancy goods, etc.)

Wallpaper

SECTION 1. RESEARCH METHODOLOGY

A. Basis of Classification

B. Industrial Concentration and its Measurement

SECTION 1

RESEARCH METHODOLOGY

The terms of reference for the study require that the analysis of concentration within the UK Paper Industry be described in terms of the following financial variables:

turnover;
profit (before tax);
cash flow[1]. (profits + depreciation);
equity or own capital (paid up shares plus reserves);
gross investment (annual additions to fixed assets gross of disposals);
exports;
number of employees;
wage bill.

British published statistics provide aggregate figures for individual industrial sectors relating to turnover, exports and, in some cases, employees and total wage bill.

In order to calculate concentration indices relating to each of the above variables, the necessary data were obtained from the published financial accounts of individual firms. The total figures so obtained were cross-checked with the published aggregate statistics to ensure that most of the firms in each sector had been identified. Although formally required to do so, except where total employment is less than one hundred, not all enterprises presented information relating to the number of employees and total wage bill, and complete analyses of these variables were not possible.

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1. The authors preferred the more conventional definition of cash flow (profit + depreciation - tax) referred to here as net cash flow.

A. Basis of Classification

1. Classification of Firms within the Industry

Before the relevant financial information could be collected, the individual establishments classified to Nomenclature Industrielle de la Communaute Europeenne (NICE) 271 and 272 (paper manufacture and paper conversion) had to be identified.

British firms are classified according to the Standard Industrial Classification (revised 1968), (SIC) system and not NICE. However, for both systems the classification of paper manufacturing and paper conversion were sufficiently similar in detail for this not to be a problem.

The UK Government Statistical Service publishes a directory of establishments classified to the Paper Industry (including establishments classified to other industries but producing paper and paper products):

Report on the Census of Production 1968
170. Directory of Businesses: Paper, Printing & Publishing

However, data in companies' financial accounts relate to the total enterprise, not to individual establishments.[2]

The identification of enterprises within the industry was achieved using:

British Paper & Board Industry Federation: List of Members;
Paper & Paper Products Industry Training Board: List of Members;
Kompass 1968 and 1972;
Phillips Paper Trade Directory;
Who Owns Whom in British Industry 1968 and 1972.

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2. The Census of Production defines "establishment" and"enterprise" as follows:

"establishment": the premises under the same ownership or management at a particular address (e.g. factory or mine);

"enterprise": one or more establishments under common ownership or control; normally consisting of a single establishment, more than one establishment owned by the same firm, or a number of establishments owned by a parent company and its subsidiary companies.

Copies of the financial accounts of individual enterprises are held centrally and were examined at Companies Registration Offices, London and Edinburgh.

2. Classification on the Basis of Output

In order to ensure the comparability of the results of this co-ordinated Common Market investigation, the terms of reference required the adoption of several general assumptions.

The assumption made relating to the classification of individual firms to specific industrial sectors was as follows: where 50% or more of the turnover of a firm is accounted for by products classified to NICE 271 or 272, then that firm is considered to be entirely producing within that sector.

The published financial statistics of individual firms relate to the total activity of the firm, and data relating to specific product lines are not available. Consequently in some cases the financial data for a given firm may not relate solely to its paper interests. For instance, if a firm makes cartons using 60% paper and 40% plastic, it is not possible to obtain the financial statistics relating to paper interests only. On the other hand, the assumption implies that where a similar firm uses 40% paper and 60% plastic, this firm will be excluded from the study on the basis that less than 50% of turnover is accounted for by NICE 271 or 272.

This classification by principal activity of the company led to some problems in the definition of the industry. Where a company with multiple activities published separate accounts for subsidiaries engaged in different activities, data from these subsidiary accounts were used in the analysis. Some large companies do not structure their financial reports in this way. In a few cases statistics relating to other activities could not be excluded from the financial data of firms whose principal products fell within our terms of reference. More significant problems occurred with manufacturers whose output of paper products is significant in relation to this industry but accounts for less than 50% of their own turnover. The most significant exclusion was the Metal Box Co. Ltd., an important producer of paper packaging.

3. Classification on the Basis of Ownership

A further assumption included in the terms of reference was that an individual firm was classified as a subsidiary of another when the owning or parent company held 90% or more of the issued capital.

This assumption did not significantly distort the ownership relationships existing within the British paper industry. (For further discussion see Section 2). However, the assumption produced an anomalous result in the cases of the Bowater Corporation which has a 50% holding in the Bowater-Scott Corporation. It became apparent that the data for this subsidiary ought to be included with that of the parent company because of their common top management, and this was in fact done throughout the research.

4. Classification problems in respect of Vertical Integration

Many firms within the paper industry are vertically integrated, manufacturing paper and board and also producing converted products. Within some companies the two activities were carried out by separate subsidiaries and financial accounts were available relating to each sector. In special cases where an individual enterprise was highly vertically integrated, advice was sought from the management of these firms, enabling the necessary corrections to be made (see Sections 2, 3 and 4).

In further cases, certain arbitrary assumptions had to be made as to whether or not a process could be classified as manufacturing or conversion. The production of paper tissues and toilet tissues was considered to be a manufacturing process only; whereas the production of surgical products, babies nappies, etc. was considered an entirely converting process.

5. Classification according to Product Groups

As a result of both the theoretical analysis of industrial concentration and discussions with individual firms and trade associations, it became apparent that in both the manufacturing and converting sectors of the industry, not all products were competitive with each other: specialty papers do not compete directly with the bulk grades of paper: fibreboard packing cases have certain characteristics which do not make them substitutes for

board cartons or paper bags: cardboard cartons, stationery and disposable babies' napkins cannot be described as competitive products. Within each of the major sectors of paper and board manufacture and conversion, there exist separate and identifiable product groupings. It was considered that in order to present a more meaningful description of concentration in terms of market shares, each product group should be individually analysed.

Ample justification for this approach can be found in the relevant literature. Ideally, product group analysis should be expanded to include all competing products. For instance, in the case of paper bags, competing products include plastic and cellulose wrapping bags. In the case of fibreboard containers, competing substitutes include wooden cases and heavy duty polythene containers. The product group analysis within the paper manufacturing sector is somewhat simpler as direct substitutes from outside the industry are fewer.

The product groups analysed were as follows:

Paper & Board Manufacturing:	Printing & Writing Paper; Packaging Paper including Tissues; Board including Corrugated Case Materials.
Paper & Board Conversion:	Non-Board Packaging (bags and multi-wall sacks); Board Packaging (cartons and fibreboard containers); Manufactured Stationery Miscellaneous products (cups, plates, fancy goods etc.); Wallpaper

B. Industrial Concentration and its Measurement

Concentration is but a single facet of the structure and organisation of an industry: among other important factors are the degree of vertical integration, the extent of diversification, and the barriers to new entrants.

The structure of an industry is of great interest to the economist; different patterns of industrial organisation imply varying behaviour among the respective buyers and sellers. From the buyer's point of view- different conditions exist if he is buying from a monopolist rather than from one of a large number of equally sized firms.

However, any conclusions as to market forces existing within an industry cannot be deduced until the "market" has been clearly defined. Competition can only exist between sellers of "competing" products: a manufacturer of paper bags does not necessarily compete with only other paper bag manufacturers, but is also aware that plastic, polythene and cellulose packaging exists, and can be used for equally acceptable forms of packaging. In other words, an industry cannot necessarily be delineated by the nature of raw materials or a method of production.

The facet of industrial structure which has attracted most attention is concentration, being perhaps the only aspect of structure which can be easily and meaningfullyquantified. Concentration describes the number and size distribution of the firms in a given industry. Several different measures of concentration have been suggested in the literature and are used in all of the series of the Commission's concentration studies.

The value of using a series of indices to measure concentration lies in an understanding of what exactly each index is measuring. Concentration has been defined as "the number and size distribution of the firms" - thus both fewness and dispersion are being measured.

The remainder of this section defines the various measures of concentration and analyses the extent to which the indices which have been suggested measure the fewness of firms, or the variability of the sizes of firms.

1. Definitions and Basic Properties of Concentration Indices

It is assumed that some variables, such as turnover, are being used to measure the sizes of firms in the market. (The same mathematical forms apply whatever the variable selected). The following notation will be used in this section:

N total number of firms in the industry;

x_i the value of a variable for Firm i, when firms are ranked in descending order with respect to that variable;

X the aggregate of the variable for the whole industry, that is,

$$\sum_{i=1}^{N} x_i$$

P_i the proportion of the aggregate accounted for by Firm i, that is,

$$\frac{x_i}{X}$$

μ the arithmetic mean value of the variable, that is, $\frac{X}{N}$

a) Concentration Ratios

The Concentration Ratio for an industry is defined as:

$$\frac{1}{X} \sum_{i=1}^{R} x_i$$

that is, it is the fraction of the total variable accounted for by the R largest firms ranked in descending order of that variable. The value of R is a parameter chosen by the user.

For any one value of R this measure gives only a limited picture of the whole industry. For this reason the concentration ratios for several

different values of R are usually quoted. It should be noted that when comparing two industries A and B it is possible for industry A to have a larger concentration ratio than industry B for small values of R, but a smaller one for large values of R . (i.e. it is possible on this measure for industry A to appear to be more concentrated than industry B for small values of R, but less concentrated for large values of R). This is illustrated in Fig. 1.

The Concentration Ratio has the advantage in a large industry that only the size of the whole industry and that of the top few firms are necessary for its calculation.

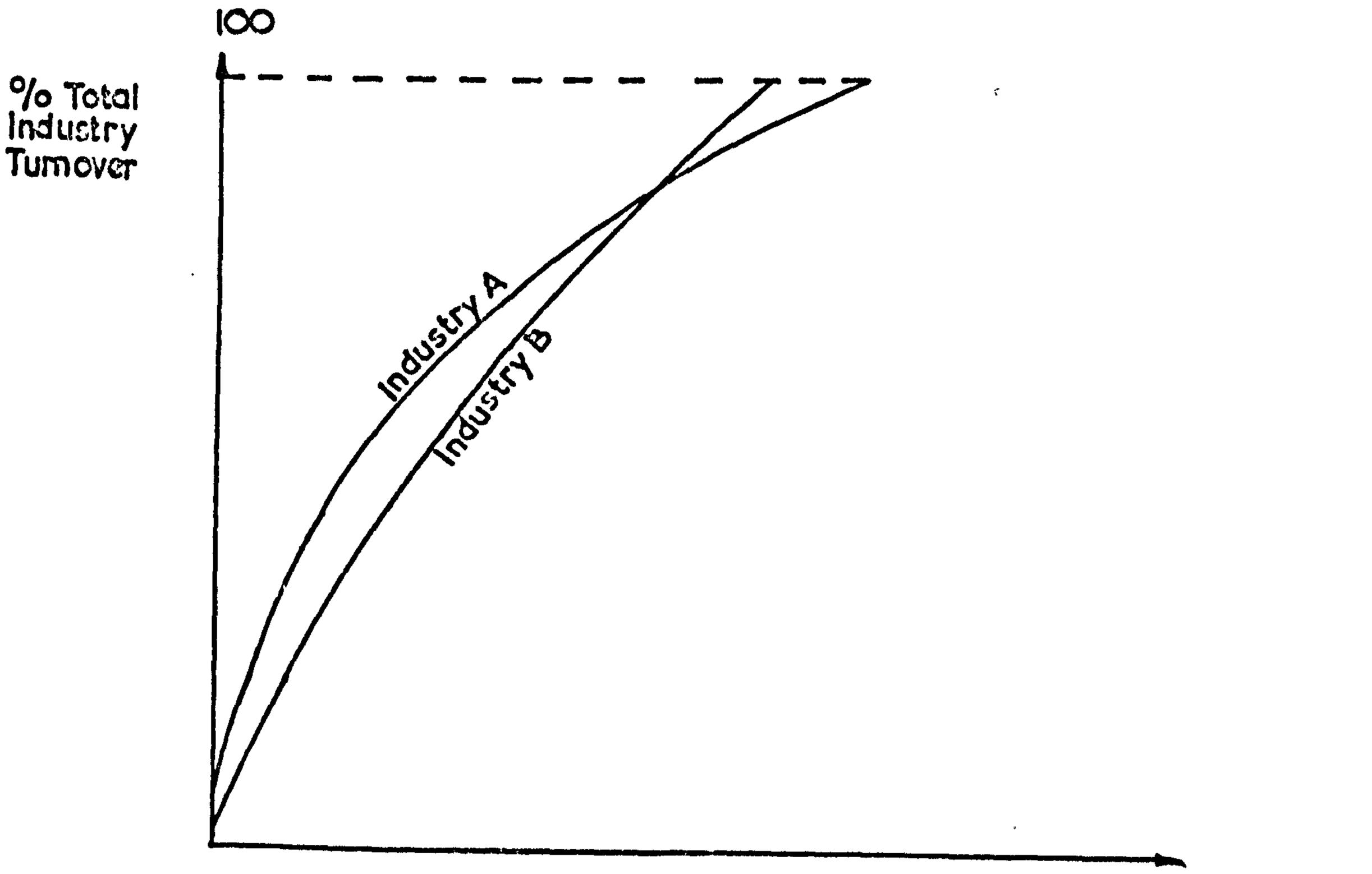

Fig. 1

b) Measures based on Variance

These include variance, standard deviation and coefficient of variation.

$$\text{Variance, } V = \frac{\sum_{i=1}^{N} (x_i - \mu)^2}{N}$$

$$\text{Standard Deviation, } \sigma = \sqrt{V}$$

$$\text{Coefficient of Variation, } c = \frac{\sigma}{\mu}$$

These are prima facie examples of measures which are concerned with the dispersion of the sizes of firms in the industry and not with the total number of firms in the industry. From the calculation point of view they have the advantage that they can be estimated from data on a random sample of firms in the industry. It is not even necessary to know the aggregate value of the variable.

c) Gini Coefficient

This measure is based on the Lorenz curve.[3] The Lorenz curve plots the percentage of total industry turnover on the vertical axis against percentage of firms cumulated from the smallest on the horizontal axis. Thus the curve is concave (degenerating into a straight line when all firms are of equal size). Where a variable other than turnover is used, the percentage of firms is cumulated from the firm with the smallest value of the variable under consideration.

The Gini Coefficient is defined (see Fig. 2) as:

$$\frac{\text{Shaded Area}}{\text{Area OXY}}$$

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3. For a complete list of references see Bibliography on Page 4.38

It ranges from 0 (all firms equal in size) to 1 (all output in the hands of a single firm). The following formula provides a method of calculation when the values of the variable are ranked in ascending order (x_j; $j+1$ to N)

$$\frac{1}{NX} \sum_{j=1}^{N} (j-1)F_j - jF_{j-1}$$

$$F_j = \sum_{k=N-j+1}^{N} x_k$$

Generally, complete data on the aggregate of the variable for the industry is necessary for the calculation of the Gini Coefficient.

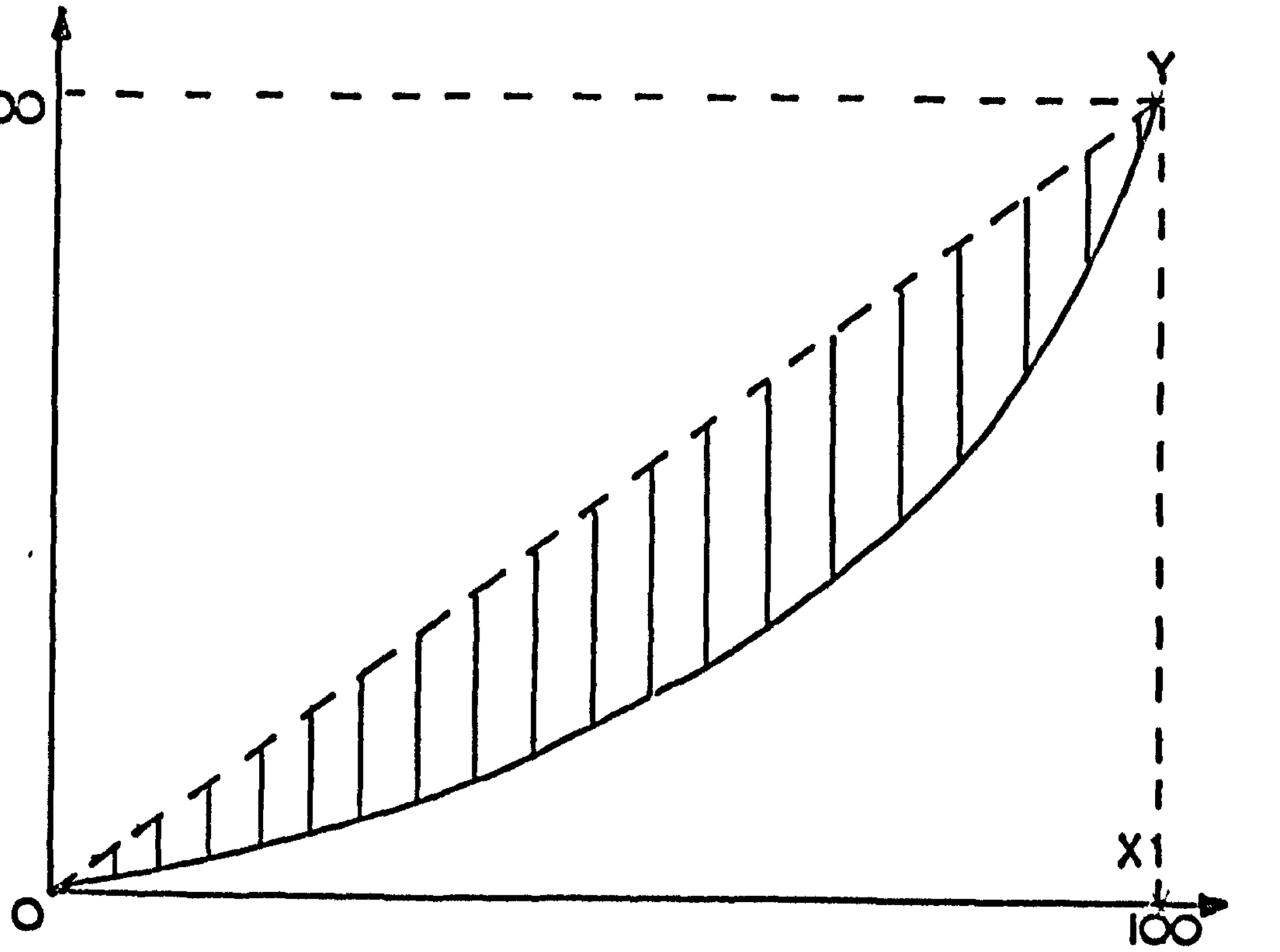

Fig. 2

% of firms cumulated from smallest

d) Herfindahl-Hirschmann Index

This was suggested by Herfindahl and is defined as the sum of the squares of the market shares, i.e.

$$\text{Herfindahl-Hirschmann Index} = \sum_{i=1}^{N} p_i^2$$

It has the interesting interpretation that it is equal to the probability of two items of output of the industry chosen at random both originating from the same firm. Thus, if the index were calculated for the paper industry, it would equal the probability that two pieces of paper chosen at random were manufactured by the same firm (for: p_1^2 is the probability of both pieces coming from the first firm, p_2^2 is the probability of both pieces coming from the second firm, etc.).
An alternative formula for the index can easily be shown to be:

$$\frac{c^2 + 1}{N}$$

where c is the coefficient of variation. Thus the index can be estimated from data on a random sample of firms in the industry providing N is known.

The index lies between $\frac{1}{N}$ and 1. Some authors prefer to define it as:

$$\text{H-H} = 1000 \sum_{i=1}^{N} p_i^2$$

i.e. to inflate its value by a multiple of 1000. This convention has been adopted by the Commission and is followed in this report.

e) Entropy

The entropy concept has its roots in information theory and its use to measure concentration is suggested by Theil et al.

Information theory states that the information content of a message that an event E has occurred is a decreasing function of the probability of occurrence of E. As the probability of E occuring approaches 1 the event

becomes a near certainty and a message stating that it has actually occurred provides little information; similarly the more unlikely the event before its realisation, the larger will be the information content of a message of its occurrence.

The decreasing function generally assumed is the logarithm of the reciprocal of the probability q, i.e.

$$h(E) = \log \frac{1}{q} = - \log q$$

where $h(E)$ is the information content of event E. (The reason for this choice is the requirement that $h(E_1 \text{ and } E_2) = h(E_1).h(E_2)$ where E_1 and E_2 are independent events.)

Prior to the receipt of a message, the expected information content of that message can be computed. The expected information content of a message on which event has occurred from a range of events $E_1 \ldots\ldots E_n$, whose probabilities, $q_1 \ldots q_n$ sum to 1, is:

$$\sum_{i=1}^{n} q_i \, H(E_i) = - \sum_{i=1}^{n} q_i \log q_i$$

and this is referred to as the entropy of this distribution.

The entropy is a measure of 'disorder'. The closer the n probabilities q_i are to $\frac{1}{n}$, and the larger n is, the less order there is in the system; disorder being maximum when all the probabilities are equal. Hence the application of the entropy concept to industrial concentration is apparent. Entropy provides a negative measure of the inequality of the shares in the total output etc. of the firms in a given industry.

In the notation introduced at the beginning of this section,

$$\text{Entropy Index, } E = - \sum_{i=1}^{N} p_i \log p_i$$

If one share is 1 and all others are 0, then $E = 0$ and the degree of concentration is maximum. If all shares are equal $(=\frac{1}{N})$ then $E = - \log N$ and the degree of concentration is minimum for that value of N.

Returning to the paper industry example, if the manufacture of paper is nearly all concentrated in the hands of one firm, then the information content of a message on where an individual piece of paper was manufactured would be low. On the other hand, if concentration is low, information as to the place of manufacture of a given piece of paper has a greater information content.

f) Linda Index

Another measure of industrial concentration is given by Linda.

$$Q_i = \frac{K - i}{i} \cdot \frac{A_i}{1 - A_i}$$

where $A_i = \frac{1}{X} \sum_{j=1}^{i} x_j$ and values of x are in descending order.

K may be any number of firms from 2 to N. (Thus Q_i is the average share of the market held by the top i firms divided by the average share of the market held by the other $(K-i)$ firms included in the sample).

The Linda Index is defined as:

$$\frac{1}{K(K-1)} = \sum_{1}^{K-1} Q_i$$

(i.e. the Linda Index is $\frac{1}{K}$ x the average of the Q_i s).

The Linda index is designed to measure the degree of inequality between the values of the variable included in a sub-sample of K units.

It is also intended to define the boundary between the oligopolists within an industry and the other firms. This boundary occurs at the first major discontinuity between values of the variable ranked in descending order. This concept implies that oligopolists can be defined in terms of the variable concerned.

Linda indices are calculated for the first two firms *(K=2)*, then the first three *(K=3)* and so on, until a minimum value is produced (that is the index for *K+1* is greater than that for *K* firms). At this point the "oligopolistic arena" is defined.

2. The Measurement of Fewness

The variance, standard deviation and coefficient of variation measure the degree of inequality within a distribution and, provided relative sizes are unchanged, will not be affected by the number of firms.

Also, the Lorenz curve can easily be seen to be the same whatever the number of firms, *N* and it follows from this that the Gini Coefficient remains constant as *N* increases.

It can be demonstrated that the Herfindahl-Hirschmann Index varies inversely with the number of firms, *N*. In the case of the Linda Index, it can be shown that if *K* is large, the Linda Index will show approximately - but not exactly - the same pattern as the Herfindahl-Hirschmann Index.

The Entropy Index depends linearly on the logarithm of *N*, the number of firms decreasing as the latter increases.

No similar generalisations can be made in the case of the Concentration Ratio as this is in essence a partial measure. However, if instead of being defined as the proportion of the industry which is in the hands of the top *R* firms, the Concentration Ratio were defined as the proportion of the industry in the hands of the top *P%* of all firms, then it would remain constant as *R* increased.

These results are summarised in Fig. 3 (where a linear transformation has been applied to each index to make scales correspond).

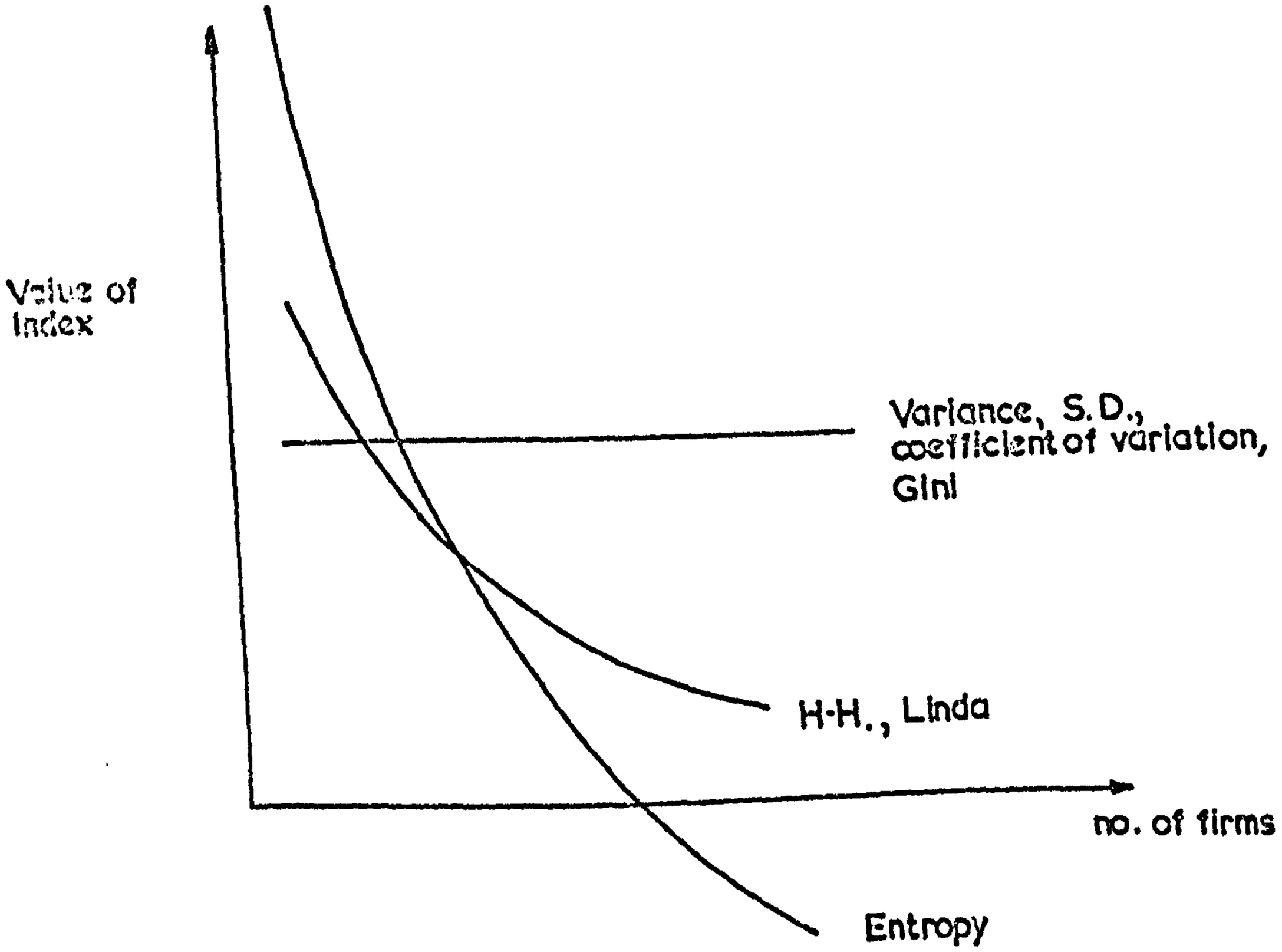

Fig. 3

When a number of industries are being compared, the entropy measure is more likely to accentuate the fewness of the firms within the industry than either the Linda or the Herfindahl-Hirschmann Index. The variance, standard deviation, coefficient of variation and Gini Coeefficient cannot be considered to be measures of fewness at all.

3. The Measurement of Dispersion

The relationship between each index and the dispersion of the variable for which it is calculated is most obvious when the values of the variable are lognormally distributed (that is the logarithms of these values are normally distributed with a mean m and a standard deviation s).[4] Some authors have suggested that distributions of sizes of firms within an industry may be lognormal, though this was not found to be the case in the paper industry (see Section 2.6 below).

The extent to which the different concentration indices measure dispersion can be mathematically deduced from the theory of lognormal distribution. Analysis shows that when the firms in the industry are lognormally distributed, each of the concentration indices is mathematically related to s. The nature of the individual relationships is presented in Fig. 4. The variance and standard deviation are not shown as these depend on m as well as s. This dependence on m is in fact a highly undesirable property for a concentration index to have. It means that if the sizes of all firms in an industry are increased by the same factor, the value of the index will change. Thus the index will depend on the unit in which sizes are measured. Also, when two industries are being compared, an index which depends on m will, in part, be merely reflecting the differences in the total sizes of the two industries.

Consequently, where the sizes of the firms within a given industry are known to be lognormally distributed, it is not necessary to calculate each of the measures of dispersion. Once s is determined each of the indices can be calculated from the formulae which have been illustrated graphically in Fig. 4 and given below for completeness:

Mean size	=	$e^{m} + 0.5s^{2}$
Variance	=	$e^{2m} + s^{2}\,(e^{s^{2}} - 1)$
		(where $e = 2.718$)
Coefficient of Variation, c	=	$(e^{s^{2}} - 1)^{\frac{1}{2}}$

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4. not to be confused with μ and σ defined on page (1.7, 1.9) above.

$$\text{Gini Coefficient} = 2\Phi\left(\frac{s}{\sqrt{2}}\right) - 1$$

(where $\Phi(z)$ is the probability that $t \leq z$ when t is $N(0,1)$

$$\text{Herfindahl Hirschmann Index} = \frac{e^{s^2}}{N}$$

$$\text{Entropy Index} = \frac{s^2}{2} - \log_e N$$

(this assumes that natural logarithms are used to calculate the index).

It should be noted that these formulae can hold only when N is large enough to provide an adequate description of the lognormal distribution. The required size for N increases as s increases. When s and N are large, the Linda Index will approximate to the formula:

$$L = \frac{e^{0.5s^2}}{\sqrt{N}}$$

(The Linda is not, however, normally calculated for the entire group of N firms.)

Thus, each of the concentration indices examined measure fewness and dispersion in different ways and to different extents. When using a series of indices to describe the concentration in a given industry, the following particular properties of the indices should be borne in mind:

(i) the variance, standard deviation, coefficient of variation and Gini Coefficient do not take any account of fewness of firms in the industry;

(ii) when two industries are being compared, the Entropy measure will reflect fewness to a greater extent than either the Herfindahl or the Linda indices;

(iii) when the distribution of sizes is lognormal (m,s) then the Gini Coefficient and the coefficient of variation are approximately linearly related to s for $0<s<1$. The Herfindahl index is a very poor measure of s in this range and the Entropy index is related to s^2;

(iv) "absolute" measures of variability such as variance and standard deviation are undesirable as they depend on the size of the total industry as well as on the proportion of it held by the individual firms;

(v) the Linda index is only appropriate for reflecting relative sizes of large and small firms in an industry and has particular application to those markets which characteristically have at their head a few large manufacturers.

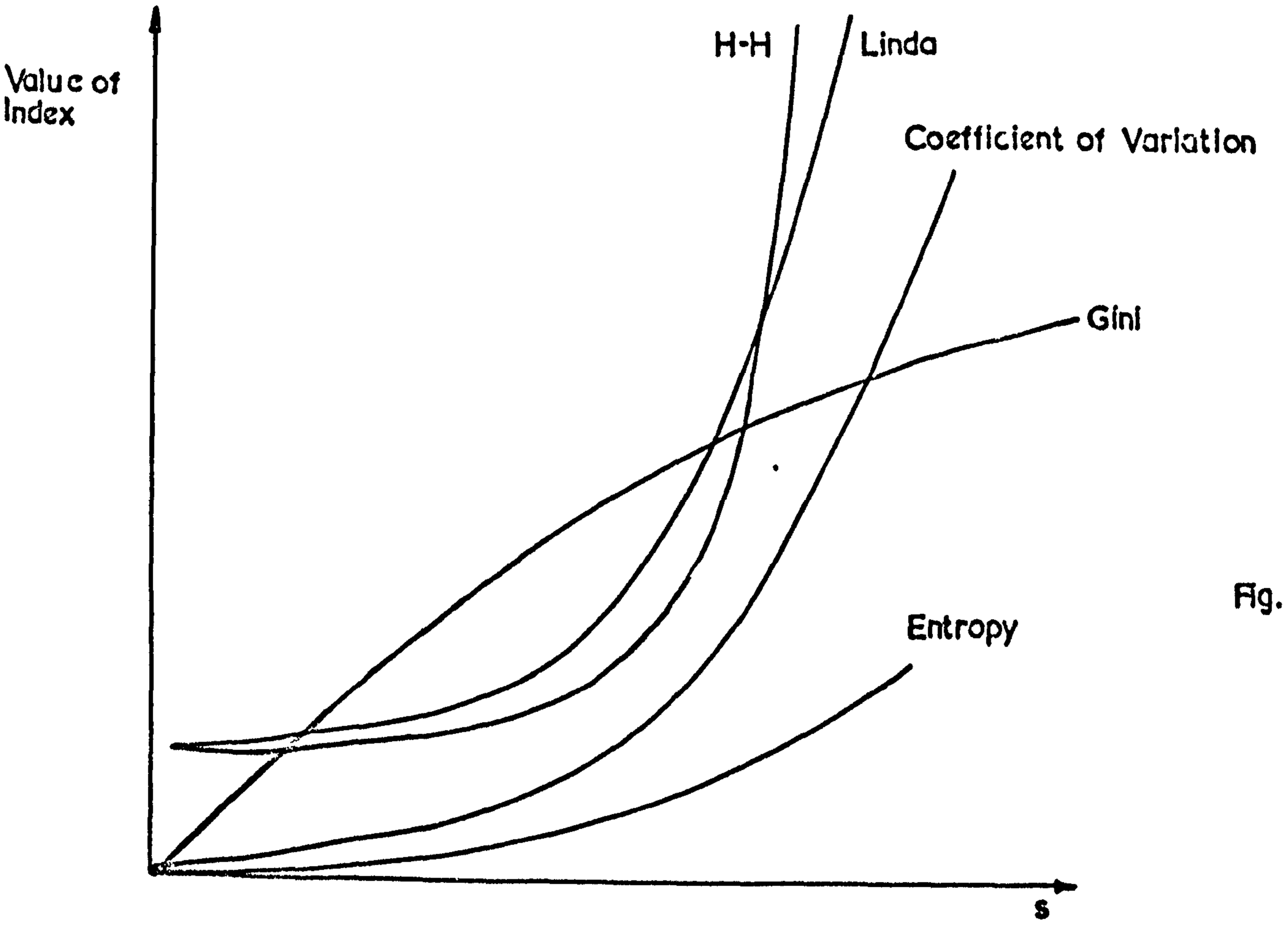


Fig. 4

SECTION 2. MANUFACTURE & CONVERSION OF PAPER & BOARD

1. Vertical integration within the industry
2. Diversification by enterprises
3. Size distribution of enterprises
4. Employment within the industry
5. The analysis of concentration
6. The test for lognormality
7. The pattern of ownership

SECTION 2

MANUFACTURE AND CONVERSION OF PAPER AND BOARD

The manufacture and conversion of paper and board are distinct and separate industrial activities. The manufacture of paper and board involves the conversion of raw materials (mainly wood pulp) into base grades of paper and board. The distinction between paper and board is a technicality based on the relative weights of the two products. The process of conversion is the transformation in any way of the basic paper and board into the final product.

Following convention within the industry, the coating of paper was considered to be part of the manufacturing process.

The UK paper industry depends heavily on imported pulp and is thus at a cost disadvantage to Scandinavia and North America which have local supplies. This cost disadvantage arises from the fact that users of imported pulp require an additional process to reverse the dehydration of the wood pulp needed prior to transportation.

The industry was greatly assisted in the past by the fact that, whereas wood pulp entered the UK duty free, paper and board imports were subject to tariffs of up to 20%. These tariffs were removed by 1967 following the formation of the EFTA in 1960.

More recently[5.] the government has taken a more positive role in encouraging the process of recovery and recycling of waste paper, which can also be used for the manufacture of certain grades of paper and board.

Since 1960 the demand for paper and board has been increasing by approximately 4% per annum by weight. Factors contributing to this increasing demand include the growth in demand for packaging items (of which paper is by far the more important, see Table 39, page 4.16; the general growth in communications and the fast growth in demand for tissue paper (particularly soft tissue); and papers and boards for specialised industrial uses.

5. 1974 UK Government Green Paper on Recycling Waste.

The British paper industry exports comparatively little of its total output: since 1968 exports of manufactured and converted paper and board have consistently represented approximately 5% of total production, by weight. Tables 1 and 2 summarise the production and trade of each sector of the industry. Exports to the EEC have been increasing over the last ten years, while traditional Commonwealth markets have remained relatively stable.

As the tables suggest, imports of paper and board continue to account for an increasing proportion of total consumption. In 1960, imports of manufactured paper and board represented 27% of total consumption by weight, 34% in 1968, and 43% in 1972; thus by 1972, almost as much paper and board was imported as was produced domestically. The principal factor behind the rapid growth in imports was the reduction in tariff barriers, mentioned above, on paper imports from Scandinavia.

The Scandinavian countries compete very strongly in the lower grades of paper and board and in semi-finished paper products, and since 1954 the proportion of UK paper consumption supplied by them has risen from a quarter to over a third. The cost advantages that the Scandinavians have over UK producers in pulp costs and in respect of fuel costs (through natural advantages such as hydroelectric power or by the use of tax-free fuel oil) are most important for the low-grade, mass-tonnage grades of paper (news-print and kraft paper).

The response of British firms to this situation has been to switch production away from lower grades towards higher quality grades, where it is advantageous for the producer to be near the point of sale, and cost disadvantages are less noticeable.

Proximity to the point of sale is probably an important factor in determining the quantity of converted products imported into the UK. As indicated in Table 2, imports of converted products represent less than 10% of total production in value terms. It is interesting to note that almost all imports are of packaging products.

Recent trends in production and trade of individual products are discussed more fully in Sections 3 and 4.

TABLE 1(a)TOTAL PRODUCTION AND TRADE - MANUFACTURE

'000 m tonnes

Year	1954	1956	1958	1960	1962	1964	1966	1968	1970	1972
Newsprint	622.1	652.8	636.0	752.7	665.8	762.2	748.6	735.3	756.9	467.5
Other printing and writing papers	779.9	845.6	850.0	973.9	899.7	1013.0	1060.6	1030.8	1060.4	930.9
Packaging papers	599.6	624.3	686.1	813.2	825.2	875.3	908.3	909.8	1095.3	1040.8
Tissues	46.1	55.7	88.4	120.0	160.3	191.5	247.7	285.7	319.6	347.0
Industrial and special purpose papers	187.1	213.7	229.9	267.8	283.6	318.8	321.8	335.6	359.3	379.4
Packaging board	660.8	713.1	810.6	919.7	902.1	1001.9	1018.3	1076.8	1009.1	861.7
Other board	182.9	177.2	189.5	216.4	216.3	239.2	235.6	288.7	302.6	310.5
Total	3078.5	3282.4	3490.5	4063.7	3953.0	4401.9	4540.9	4662.7	4903.2	4337.8

British Paper and Board Industry Federation

'000 m tonnes; indices 1954 = 100

Year	Total Production		Imports		Exports	
	Index number	'000 m tonnes	Index number	'000 m tonnes	Index number	'000 m tonnes
1954	100	3080	100	910	100	250
1956	107	3280	116	1050	110	270
1958	113	3490	126	1150	90	220
1960	132	4060	157	1430	73	180
1962	128	3950	168	1530	66	160
1964	143	4400	206	1870	69	170
1966	148	4540	208	1890	61	150
1968	151	4660	250	2270	73	180
1970	159	4900	276	2510	93	230
1972	141	4340	337	3050	100	250

B.P.B.I.F.

TABLE 1(b): VALUE OF TOTAL PRODUCTION - MANUFACTURE

£'000

Year	1963	1968	1972	1973
Newsprint	39,141	47,336	36,435	38,490
Other printing and writing papers	121,138	149,375	186,864	238,389
Packaging papers	53,108	61,444	82,144	102,697
Tissues	9,274	12,947	16,111	21,370
Industrial and special purpose papers	39,167	41,237	65,080	93,398
Packaging board	40,833	66,724	71,058	86,648
Other board	16,145	26,054	28,728	31,918
TOTAL	318,806	405,117	486,420	612,910

1963, 1968 Census of Production
1972, 1973 Business Monitor

TABLE 1(c): VALUE OF EXTERNAL TRADE - MANUFACTURE

£'000

EXPORTS / IMPORTS	1971	1972
Newsprint	12 / 60,060	20 / 83,759
Other printing and writing papers	18,116 / 48,732	19,775 / 41,169
Packaging Papers	5,668 / 75,676	5,532 / 82,418
Tissues	4,536 / 5,532	4,773 / 6,392
Industrial and special purpose paper	12,616 / 28,224	12,072 / 35,210
Packaging Board	836 / 12,452	885 / 12,926
Other board	3,372 / 1,348	3,713 / 1,475

Business Monitor

Further details of external trade in manufactures and converted products in terms of major origins and destinations is given in Appendix C.

TABLE 2 (a): VALUE OF TOTAL PRODUCTION - CONVERSION

£'000

Year	1963	1968	1971	1972	1973
Wallcoverings	18,715*	36,509	50,173	63,535	71,800
Stationery	62,308	108,107	181,847	203,938	239,741
Miscellaneous	65,059	110,403	n/a	157,972	192,622
Packaging - not incl. board	61,719	93,593	n/a	289,205	348,144
Board Packaging	162,946	233,608	312,148	350,452	419,075
TOTAL	370,747	582,220	n/a	1,065,102	1,271,382

* vinyl wallcoverings n/a

1963, 1968 Census of Production
1971, 1972, 1973 Business Monitor

TABLE 2(b): VALUE OF EXTERNAL TRADE - CONVERSION

£'000

EXPORTS / IMPORTS	Year	1971	1972	1973
	Wallcoverings	11,435 / 640	16,702 / 1,275	21,767 / 1,589
	Stationery	3,736 / 514	3,462 / 743	2,791 / 960
	Miscellaneous	n/a	8,865 / 4,088	12,745 / 4,635
	Packaging - not Board	n/a	4,563 / 15,387	6,415 / 23,841
	Board Packaging	n/a	6,459 / 58,103	8,537 / 72,647
	TOTAL	n/a	40,051 / 79,596	52,255 / 103,672

Business Monitor

1. Vertical Integration within the Industry

Although distinct, the two industrial sectors of manufacturing and conversion are closely related; the converting sector is largely dependent on the products of the manufacturers. For this reason, the extent of vertical integration through the two sectors is of importance.

Individual firms within the industry have two ways of increasing vertical integration:

(a) expanding their own manufacturing capacity backwards or forwards (as appropriate) to cover more stages of the production of the final product;

(b) acquiring a subsidiary company which undertakes a further stage in the production process.

TABLE 3: VERTICAL INTEGRATION WITHIN PAPER & BOARD MANUFACTURING AND CONVERSION SECTORS IN 1968

	Total no. of companies	Total no. of enterprises
No. of "single-company" organisations identified engaged in:		
manufacture only	40	40
conversion only	152	152
both	0	0
No. of "multi-company" organisations (groups) identified engaged in:		
manufacture only	10	56
conversion only	9	33
both	18	99

The term "company" refers here to an undertaking producing its own financial accounting reports. The term "organisation" refers here to the ultimate controlling board of a grouping of subsidiaries with the same ownership.

As Table 3 indicates, the "single-company" organisations (i.e. independent organisations with no subsidiary companies) identified in the industry are either producing entirely within the converting sector or entirely within the manufacturing sector. None of these organisations integrates vertically.

An examination of the "multi-company" organisations (i.e. ultimate controlling organisations with one or more subsidiary trading companies) shows the opposite picture. Half of the "groups" have subsidiaries engaged in both industrial sectors, and are thus described as vertically integrated. It is interesting to note that among the subsidiary companies of such vertically integrated groups, in the majority of cases each subsidiary tends to be either exclusively manufacturing or converting - as was the pattern among the "single-company"organisations. One major exception to this rule is the largest stationery manufacturer, which both manufactures the paper and converts it to its final products.

2. Diversification by enterprises

As previously stated, individual companies were classified to paper and board manufacture and conversion if these products accounted for more than 50% of their activity.

Consequently, where diversification has been undertaken by the "single-company" organisations, this by definition cannot account for a greater proportion of activity than paper and board products. In fact, product diversification is not a significant characteristic of such companies.

Those subsidiary companies which are part of "multi-company" groupings will again by definition comprise the paper and board interests of such groups. However, in several instances, these groupings of companies will be significantly diversified.

TABLE 4: DIVERSIFICATION WITHIN "MULTI-COMPANY" GROUPS

Number of multi-company groups identified in 1968 (Table 3)	37
of which,	
exclusive to paper and board industry	21
having interests in other industries	16
Industrial areas of diversification:	
engineering/building products	8
food/tobacco/consumer goods	5
printing/publishing/office equipment	3

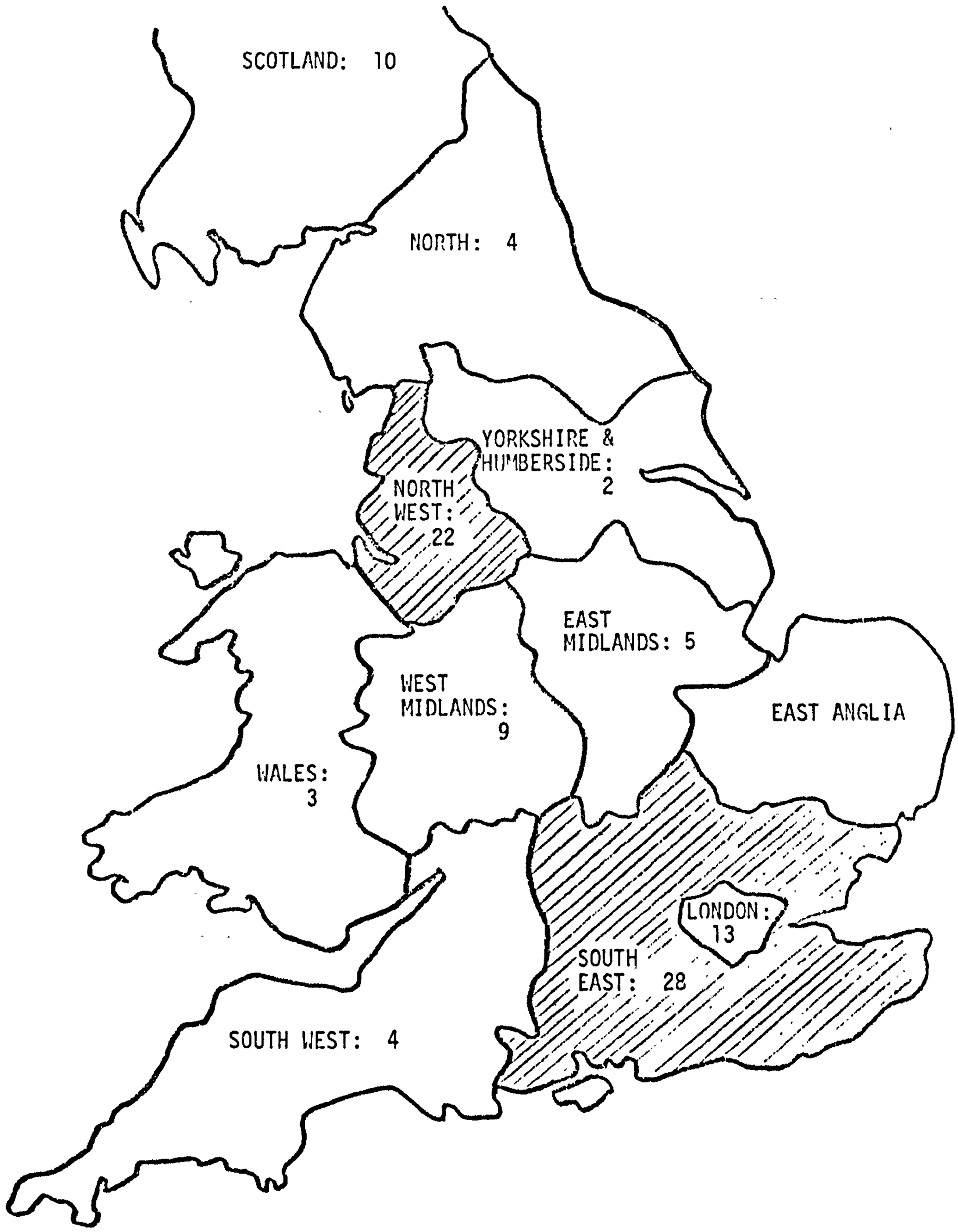
The following points of interest arose from this analysis: of the ten organisations engaged in paper manufacture but not in conversion, only one was part of a diversified "group". Diversified conglomerates have interests either in both manufacturing and conversion together, or in conversion only.

3. Summary of industry structure

To summarise, the UK paper and board industry is dominated by several large "groups" whose subsidiaries undertake both manufacturing and converting processes. In addition, several of these groupings are themselves part of highly diversified conglomerates.

These factors give the vertically integrated groups significant economic advantages over rivals as is characteristic of any oligopolistic market structure. In this case, the oligopolists' strength lies in the fact that being both manufacturers and converters, they have not only an assured market for their manufactured products, but, conversely, they have guaranteed raw materials for their converting subsidiaries.

MAP TO SHOW REGIONAL DISTRIBUTION OF THE LARGEST 100 COMPANIES IN THE PAPER & BOARD INDUSTRY



4. Employment within the Industry

Statistics of persons employed in the industry are published in aggregate form only, and these are shown in the table below.

TABLE 5: TOTAL EMPLOYEES CLASSIFIED ACCORDING TO MAIN ACTIVITY OF ESTABLISHMENT OF EMPLOYMENT

	1968	1969	1970	1971	1972
Paper, board and pulp manufacture and coating	83,687	80,353	73,965	69,015	66,763
Converters:					
Bag	6,419	6,570	6,097	5,424	5,768
Box	17,237	15,211	14,851	14,257	14,765
Flexible packaging	9,942	11,090	9,717	9,438	9,800
Fibreboard packing case	24,870	21,960	22,366	22,030	22,498
Carton	23,128	23,094	21,741	21,227	22,050
Other converting	13,573	22,583	20,014	20,851	21,656
Stationery and envelopes	19,074	19,168	19,028	18,806	18,790
Miscellaneous	9,727	8,652	7,637	6,952	8,212
Wallpaper	7,504	9,894	6,817	7,068	6,058
TOTAL	215,161	218,575	202,233	195,068	196,360

Paper and Paper Products Industry Training Board

The aggregate level of employment within the UK paper and board industry reflects the prevailing economic conditions within the industry, which have been discussed in the preceding sections of Part 2.

Despite an increasing import percentage, due to the competitive disadvantage of UK producers already described, the paper industry maintained employment in 1967/68, through an unexpected boom in consumer spending.

In 1969 the supply of pulp began to fall, resulting in higher prices. However, Scandinavian paper prices were also allowed to rise, and thus any dramatic increase in the import share of consumption was avoided, and employment was generally maintained throughout the industry.

In contrast to 1969, 1970 saw an almost 10% fall in employment, which was particularly marked among paper and board manufacturers. Pulp prices were increased by around 10% on average from 1.1.70, when the industry had to combat other rising costs, particularly those of wages and transport. The magnitude of price increases was checked by the need to match the prices of competing imported papers.

Although pulp prices rose again in 1971, a world slackening of demand for pulp limited the amount of the increase. However, the UK paper industry was also faced with other substantial cost increases, particularly in fuel oil and wages. This situation precipitated a contraction in the industry and the decision by many of the large groups to reduce their involvement in low grade papers. Employment within the industry fell by a further 7,000.

The figures for 1972 suggest that the industry was beginning to emerge from the downturn in trade. However, the over-capacity situation in the light of falling world demand suggests further rationalisation to come.

The performance of the industry since 1968 is further analysed in terms of profitability in the sections dealing with individual product groups.

5. The Analysis of Concentration

Sections 1 - 4 have outlined the salient economic features of the UK paper and board industry over the past decade. Against this background, the evolving pattern of concentration within the industry can be now examined.

The pattern of concentration between 1968 - 1972 inclusive within the two industrial sectors of paper and board manufacture and conversion was measured by a series of indices applied to the following variables:

turnover;
exports;
pre-tax profits;
cash flow (profits + depreciation);
net cash flow (profits + depreciation - tax);
own capital or equity;
gross annual investment.

Three methodological problems arose from this analysis. First, as previously stated, concentration indices cannot theoretically be calculated for zero or negative values of a variable. Thus, in any given year, zero and negative values of variables were omitted. This convention, adopted by the Commission, leads to some problems of interpretation, in respect of those variables which had negative or zero values even though the company was trading. These variables include profits, cash flow, exports and (in a few cases) gross investment. The following implications should be noted:

(a) the size of the sample of companies is different for different variables in the same year;

(b) the mean values of these variables represent the means of positive values only. For this reason, these arithmetic means cannot be used to calculate ratios such as average return on equity, average margin on sales and similar standard ratios;

(c) those indices which measure the dispersion of the variable (e.g. the coefficient of variation) tend to understate that dispersion when zero and negative values are excluded.

Secondly, the development of concentration is studied over a five year period only. Discussions with representatives of the industry pointed out the cyclical nature of the trade based on an approximate ten year cycle period. Consequently, the period chosen is not felt to be adequate to permit firm conclusions as to the trends in concentration.

Thirdly, concentration indices as described and used within this study measure the size and dispersion of UK producers relative to the total UK production. However, as has been previously stated, the UK paper and board industry represents approximately 60% of total UK consumption of all paper and board and converted products. This fact is particularly important when conclusions as to market dominance of individual firms are being considered.

The following tables contain an analysis of sales turnover of the firms which were identified within the manufacturing (Table 6) and converting (Table 7) sectors.

It will be noted that the estimates of total turnover for each sector differ from the corresponding published figure in Tables 1(a) and 2, page 2.4, 5. This discrepancy occurs mainly because the Census of Production, the source of the published aggregate data, is based on individual establishments. Paper manufacture and conversion activities of the same firm can be more easily distinguished by this method, both from each other and, in the case of diversified enterprises, from activities outside the paper industry.

Table 8 compares the published aggregate turnover figures for 1968 and 1972 with the sums of individual company data analysed by the authors. This comparison shows that most of the discrepancies are due to incomplete distinction between manufacturing and converting interests of vertically integrated enterprises within the paper industry.

When these two sectors are combined, the sums of the individual company data used in this analysis are fairly close to the published statistics. Since data for individual firms for turnover and for other variables, are available only from their published accounts, complete reconciliation with published statistics was not possible.

TABLE 6: ANALYSIS OF TURNOVER OF MANUFACTURING ORGANISATIONS

Year	1968	1969	1970	1971	1972
Number of Organisations[7.]	64	65	67	66	66
Total Turnover (£'000)	469,656	521,486	569,687	567,403	622,911
Mean (£'000)	7,338	8,023	8,503	8,597	9,438
Coefficient of Variation	2.03	2.08	2.10	2.04	2.05
Gini	0.728	0.736	0.731	0.720	0.715
Herfindahl-Hirschmann	80.2	82.0	80.8	78.3	78.9
Entropy	-133.4	-132.8	-134.5	-135.9	-136.3
Linda Index for N* / Concentration Ratios %					
= 2	0.562 / 29.2	0.543 / 31.6	0.642 / 31.8	0.721 / 30.8	0.742 / 31.5
= 4	0.411 / 50.6	0.460 / 50.6	0.501 / 49.7	0.483 / 48.9	0.500 / 49.0
= 8	0.361 / 67.5	0.359 / 67.3	0.370 / 65.8	0.369 / 64.5	0.388 / 64.0
= 10	0.327 / 72.6	0.311 / 73.0	0.318 / 71.5	0.312 / 70.3	0.320 / 69.8
= 12	0.313 / 76.4	0.300 / 77.1	0.299 / 75.8	0.294 / 74.5	0.296 / 74.0
= 20	0.245 / 87.1	0.264 / 87.2	0.255 / 86.3	0.241 / 85.5	0.240 / 85.0
= 30	0.237 / 93.1	0.240 / 93.3	0.233 / 92.4	0.220 / 92.1	0.215 / 92.0
= 40	0.221 / 96.7	0.225 / 96.8	0.212 / 96.2	0.200 / 96.2	0.199 / 95.9

7. Each "multi-enterprise" organisation (group) was counted as one organisation - total no. of enterprises is not recorded.

TABLE 7: ANALYSIS OF TURNOVER OF CONVERTING ORGANISATIONS, EXCLUDING WALLCOVERINGS[8].

Year	1968	1969	1970	1971	1972
Number of Organisations[7].	179	174	171	161	145
Total Turnover (£'000)	510,557	577,050	645,618	669,197	738,686
Mean (£'000)	2,852	3,316	3,776	4,157	5,094
Coefficient of Variation	4.09	3.97	3.84	3.70	3.50
Gini	0.829	0.829	0.831	0.823	0.824
Herfindahl-Hirschmann	98.96	96.46	91.97	91.12	91.16
Entropy	-140.4	-140.7	-141.8	-142.1	-140.1
Linda Index for N* / Concentration Ratios %					
= 2	0.553 / 40.2	0.559 / 39.4	0.589 / 38.3	0.603 / 38.0	0.613 / 37.8
= 4	0.598 / 54.9	0.549 / 54.6	0.547 / 53.1	0.552 / 52.8	0.539 / 53.1
= 8	0.543 / 67.3	0.541 / 66.7	0.535 / 65.3	0.529 / 64.9	0.526 / 65.1
= 10	0.475 / 71.1	0.480 / 70.3	0.480 / 68.8	0.464 / 68.6	0.468 / 68.7
= 12	0.415 / 74.5	0.415 / 73.7	0.409 / 72.3	0.395 / 72.2	0.399 / 72.2
= 20	0.337 / 82.8	0.308 / 83.0	0.271 / 82.6	0.267 / 82.7	0.259 / 83.3
= 30	0.316 / 87.2	0.305 / 87.6	0.268 / 88.0	0.268 / 87.7	0.254 / 88.9
= 40	0.295 / 89.8	0.291 / 90.1	0.268 / 90.6	0.261 / 90.5	0.251 / 91.7

8. See Section 4.5, Page 4.36

TABLE 8: RECONCILIATIONS OF PUBLISHED STATISTICS WITH ACCOUNTING DATA OF FIRMS IDENTIFIED IN THE INDUSTRY

£'000

	1968	1972
Published statistics		
Converting	582,220	1,065,102
less Wallcoverings	36,509	63,535
	545,711	1,001,567
Manufacturing	405,117	486,420
	950,828	1,487,987
Aggregation of individual firms identified		
Converting	510,526	738,703
Manufacturing	469,651	622,908
	980,177	1,361,611

Tables 6 and 7 allow an immediate comparison of the two sectors of the UK paper industry. The converting sector is characterised by a large number of small organisations, as has been demonstrated in the bar charts, pages 2.9 and 2.10. This fact is reflected in both the relative numbers of organisations and in the mean turnover values.

The extent of the variation of the actual turnover of individual companies from the mean turnover of the sector is reflected in the coefficient of variation. The value of this index for converting organisations is almost twice the value for manufacturing organisations. This reflects the relative nature of production within each sector; the more capital-intensive manufacturing sector means greater standardisation of the possible ranges of output. Converting organisations, on the other hand, can feasibly produce a far wider range of output. Between 1968-1972 the value of the

coefficient of variation for the conversion sector has fallen 14%, compared with the almost static value for the manufacturing sector.

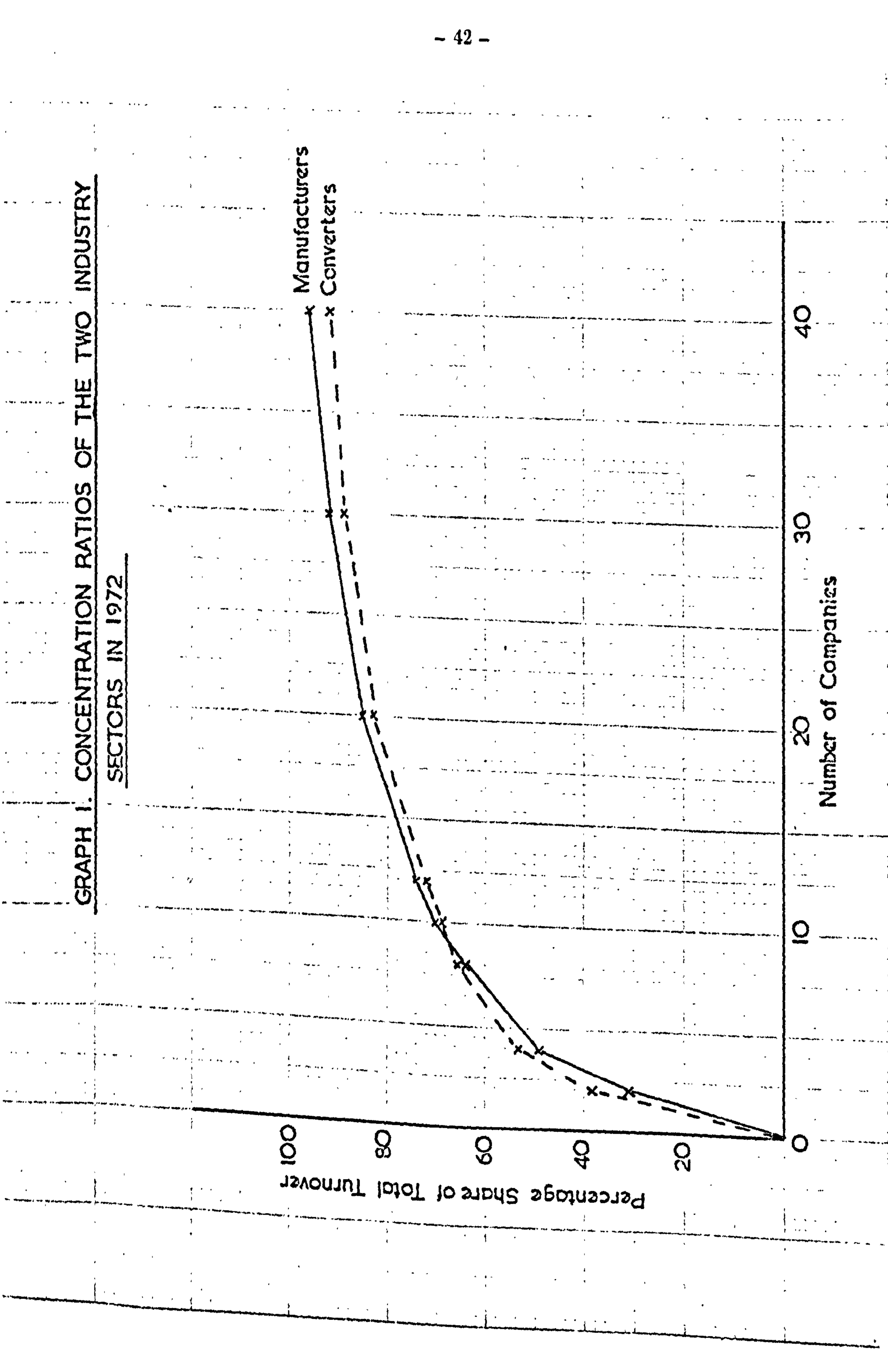
The relative values of the Gini coefficient indicate that the converting sector is more concentrated than the manufacturing sector. The explanation of this is found by examining Graph 1 overleaf, which shows the percentage share of total turnover held by individual companies in 1972. In manufacturing, the concentration ratio corresponding to the first quartile (approximately the 17 largest firms) was 82%; in converting, the corresponding ratio (for the 36 largest firms) was 96%.

It will be noted that whereas the other indices all show a greater degree of concentration in conversion than in manufacture, the Entropy index shows the opposite result. This is a reflection of the greater sensitivity of the Entropy index to the number of firms included in the calculation.

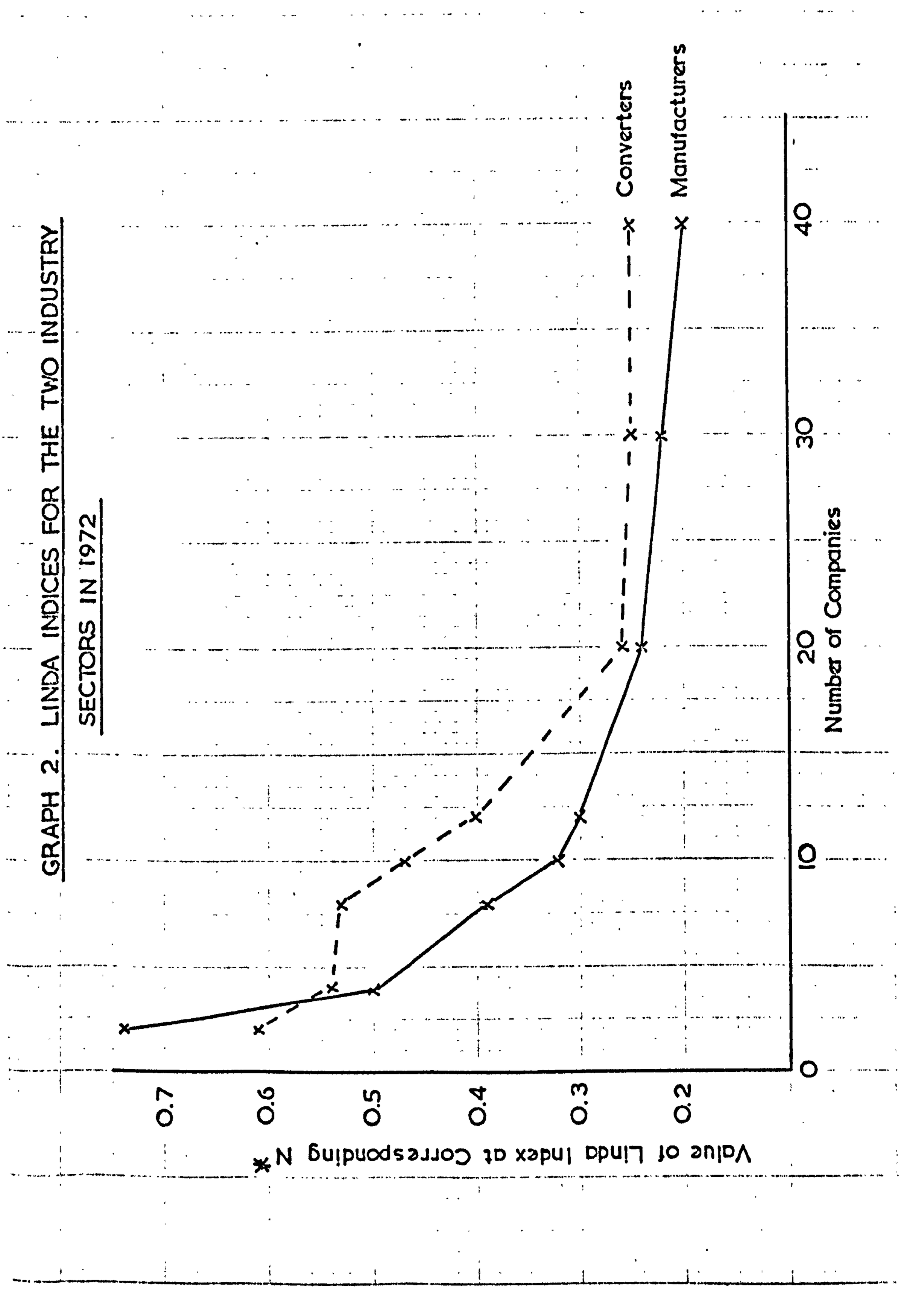
The values of the Linda index calculated for the variable turnover are plotted on Graph 2. Both the manufacturing and converting sectors of the industry exhibit the same pattern of a falling Linda curve, in all years 1968-1972, with no minimum point of inflection before the fortieth company is reached. This would suggest that no oligopoly existed in either sector of the industry - or, in other words, when the firms were ranked in descending order of turnover, no distinct "threshold" or discontinuity of size was observed, implying no "oligopolistic arena".

The examination of the separate product groups within each sector of the industry contained in Sections 3 and 4 of this Report refutes this conclusion. The explanation lies in the fact that each sector of the industry has specialised into several distinct non-competing product groups. Each product group exhibits the characteristics of an oligopoly having at its head a small number of large firms. The sizes of these individual oligopolists will vary from one product group to another according to nature of production. Thus, the summing together of a series of "individual oligopolies" does not produce a single "all industry" oligopoly, but rather the varying size of the oligopolists produces no point of discontinuity in sizes and hence no "oligopolistic arena" can be identified.

GRAPH I. CONCENTRATION RATIOS OF THE TWO INDUSTRY SECTORS IN 1972



GRAPH 2. LINDA INDICES FOR THE TWO INDUSTRY SECTORS IN 1972



This is the situation in both the manufacturing and converting sectors of the paper industry. Further analyses of each product group are contained in Sections 3 and 4.

For both the manufacturing and converting sectors, analyses were undertaken of the other data variables (exports, profits, cash flow, equity and investment) relating to the individual organisations within the industry. The full series of concentration indices calculated for each of the financial variables examined are contained in Appendix A.

As stated at the beginning of the Section, concentration indices cannot be applied to variables with negative or zero values. This problem did not arise in the analysis of turnover, as any firm with zero turnover in any year is considered to be non-trading in that year and is omitted. Data most affected by this criterion are those relating to exports and profits: only a proportion of the firms identified in each sector are exporters; and within each sector a few firms will make losses in any given year. Consequently the number of data items for these variables will be less than the total number of companies in any year.

Tables 9 and 10 show the numbers of organisations in each sector having data relating to each variable in each year 1968-1972. In the case of profits, both the amount of profits and losses made in each year are shown.

Having examined the extent of concentration in sales turnover within each sector of the industry, further analysis was undertaken to assess the concentration of the other financial variables in Tables 9 and 10. As stated, the concentration indices calculated for all variables are contained in Appendix A. These indices describe the concentration of each

TABLE 9: NUMBERS OF FINANCIAL STATISTICS RELATING TO MANUFACTURING ORGANISATIONS

Year	No. of organisations with positive values of variable						
	Turnover	Net profit	Losses	Net cash flow	Invest-ment	Equity	Exports
	No. / £'000 total of variable		No. / £'000 total of variable				
1968	64	59 / 33,800	5 / 1,500	62	64	64	54
1969	65	63 / 33,400	2 / 900	64	65	65	57
1970	67	59 / 25,300	8 / 900	63	67	67	61
1971	66	57 / 18,900	9 / 2,000	60	66	65	59
1972	66	58 / 26,600	8 / 1,300	63	66	66	60

TABLE 10: NUMBERS OF FINANCIAL STATISTICS RELATING TO CONVERTING ORGANISATIONS

Year	No. of organisations with positive values of variable						
	Turnover	Net profit	Losses	Net cash flow	Invest-ment	Equity	Exports
	No. / £'000 total of variable		No. / £'000 total of variable				
1968	179	177 / 38400	2 / 700	177	178	179	154
1969	174	172 / 42000	2 / 500	172	172	174	150
1970	171	168 / 39400	3 / 500	170	171	171	147
1971	161	154 / 43000	7 / 800	158	161	161	137
1972	145	140 / 53200	5 / 1700	142	145	144	124

variable in isolation. For example the table relating to manufacture on page 128 shows that in 1970 the ten largest manufacturing companies in terms of turnover accounted for 71.5% of total turnover and that the ten manufacturing companies with the greatest profits accounted for 70.3% of profits. However, only six firms were common to both these groups and the order of firms differed according to which variable was used for ranking.

Appendix B sets out more comprehensive statistical evidence on differences in ranking in both manufacturing and conversion. Because of the wide variations, it was decided to omit from this report certain tabulated comparisons of the financial variables, which have appeared in reports produced in other member countries of the EEC and which are valid only when differences in ranking are small. This decision is explained more fully in the Appendix.

Of all the variables included in the analysis, turnover presented the fewest problems of definition and interpretation. For this reason, it was decided to rank firms according to turnover and study the distribution of other financial variables in relation to this ranking.

In other words, having determined that the top 4 manufacturers (in terms of turnover) account for 50% of total turnover of the sector, it was of interest to see whether these same 4 firms also accounted for 50% of profits, exports, cash flow, equity and investment.

For each sector of the industry, the percentage share of the total of each financial variable held by the largest 2, 4 and 10 companies in turnover terms was calculated. The results are shown for the manufacturing sector in Table 11 and for the converting sector in Table 12.

From Appendix A, it may be noted that, in the converting sector, exports were more concentrated than any other financial variable, according to most of the alternative indices. This greater degree of concentration occurred in each of the five years; in 1972 ten of the 145 companies accounted for 87% of exports. From data in Table 2 above, it can be calculated that exports were equal to only 3.7% of the converting sector's output.

The results revealed by this analysis were particularly interesting in respect of profits. (In the event of one of the top ten companies in either section making a loss, this was included as a negative figure). Considering Table 11 first, in 1968 the percentage of pre-tax profits held by the ten manufacturers with the largest turnover was similar to the percentage shares of turnover (i.e. the largest two companies held 29% of turnover and 32% of profits; the largest four, 50% of turnover and 54% of profits, and so on). But in the following years, 1969-1972, the percentage share of total profits fell quite dramatically, the fall being particularly marked for the top two firms. This pattern is reflected in the net cash flow percentages, this being defined as (profit - tax + depreciation).

The results in Table 12 relating to converters do not show such a dramatic slump in the percentage share of profits as was the case for the manufacturers. The pattern of profit shares is more variable, but even so the figures suggest that at least among the top four firms there was some loss in the percentage share of profits relative to turnover.

In both sectors of the industry, the percentage shares of exports and gross annual investments consistently fell below the equivalent shares of total turnover. Again, this pattern was less marked among the converting organisations than among the manufacturers. The only variable for which the percentage share was greater than for the corresponding turnover share was equity, and this was the case in both sectors of the industry.

TABLE 11: PERCENTAGE OF TOTAL FINANCIAL VARIABLES HELD BY TOP 2, 4 & 10 ORGANISATIONS RANKED IN DESCENDING ORDER OF TURNOVER

n =	Turnover	Exports	Pre-Tax Profits	Net Cash Flow	Equity	Annual Invest-ment
MANUFACTURERS 1968						
2	29.2	34.3	32.2	33.8	35.2	30.1
4	50.6	44.2	45.1	49.6	52.1	43.5
10	72.6	60.5	72.0	73.8	72.1	58.9
MANUFACTURERS 1969						
2	31.6	25.5	26.1	28.3	35.9	33.2
4	50.6	33.6	39.8	43.0	51.9	45.0
10	73.0	56.0	67.6	65.7	73.0	62.3
MANUFACTURERS 1970						
2	31.8	34.7	19.5	25.2	35.5	31.7
4	49.7	43.1	45.6	45.5	51.5	41.8
10	71.5	61.0	63.7	66.4	71.7	67.3
MANUFACTURERS 1971						
2	30.8	30.3	12.9	22.4	35.0	28.9
4	48.9	38.2	45.2	44.4	49.6	40.9
10	70.6	54.3	59.7	69.4	74.1	58.7
MANUFACTURERS 1972						
2	31.5	34.4	8.3	25.0	36.7	37.6
4	49.0	40.6	39.7	43.8	50.7	48.7
10	69.8	58.3	59.5	64.1	75.0	67.9

TABLE 12: PERCENTAGE OF TOTAL FINANCIAL VARIABLES HELD BY TOP 2, 4 & 10 ORGANISATIONS RANKED IN DESCENDING ORDER OF TURNOVER

n=	Turnover	Exports	Pre-Tax Profits	Net Cash Flow	Equity	Annual Invest-ment
CONVERTERS 1968						
2	40.2	36.4	36.7	33.4	46.6	28.0
4	54.9	39.2	50.8	50.4	58.8	43.4
10	70.1	78.9	72.8	70.9	69.9	56.9
CONVERTERS 1969						
2	39.4	35.9	34.4	33.5	45.0	24.6
4	54.6	40.5	48.1	49.1	57.1	42.0
10	70.3	76.9	71.6	69.4	67.1	55.5
CONVERTERS 1970						
2	38.3	39.2	37.7	32.7	44.4	23.1
4	53.1	45.1	50.5	48.2	56.3	44.5
10	68.8	72.5	68.5	66.6	63.2	56.2
CONVERTERS 1971						
2	38.0	32.2	35.8	31.5	42.7	30.8
4	52.8	36.7	48.8	46.7	55.1	48.4
10	68.6	65.0	68.2	64.8	61.0	65.8
CONVERTERS 1972						
2	37.8	31.6	35.9	32.1	44.6	n/a
4	53.1	35.6	49.4	47.8	57.1	
10	68.7	61.4	68.3	67.7	67.5	

TABLE 13:

INTERNATIONAL COMPARISON OF CONCENTRATION OF SALES - TURNOVER IN 1969 ONLY

	Number	Coefficient of Variation	Gini	Herfindahl Hirschmann	Entropy	CR at 4 / Linda n* = 4	CR at 10 / Linda n*= 10
MANUFACTURING (NICE 271)							
Germany	189	3.43	0.83	67.6	-154.4	40.4 / 0.67	59.1 / 0.32
Italy	532	3.47	0.75	24.5	-205.9	23.2 / 0.46	42.0 / 0.19
Holland	19	1.60	0.62	186.7	-93.6	71.8 / 0.83	88.6 / 0.73
UK	65	2.08	0.74	82.0	-132.8	50.6 / 0.46	73.0 / 0.31
CONVERSION (NICE 272)							
Germany	1121	5.59	0.73	28.8	-230.6	27.6 / 0.72	36.4 / 0.41
Italy	704	1.68	0.44	5.42	-260.6	8.9 / 0.34	18.3 / 0.15
Holland	98	1.36	0.58	29.2	-172.6	25.3	46.2 (at 12)
UK	174	3.97	0.83	96.5	-140.7	54.6 / 0.55	70.3 / 0.48

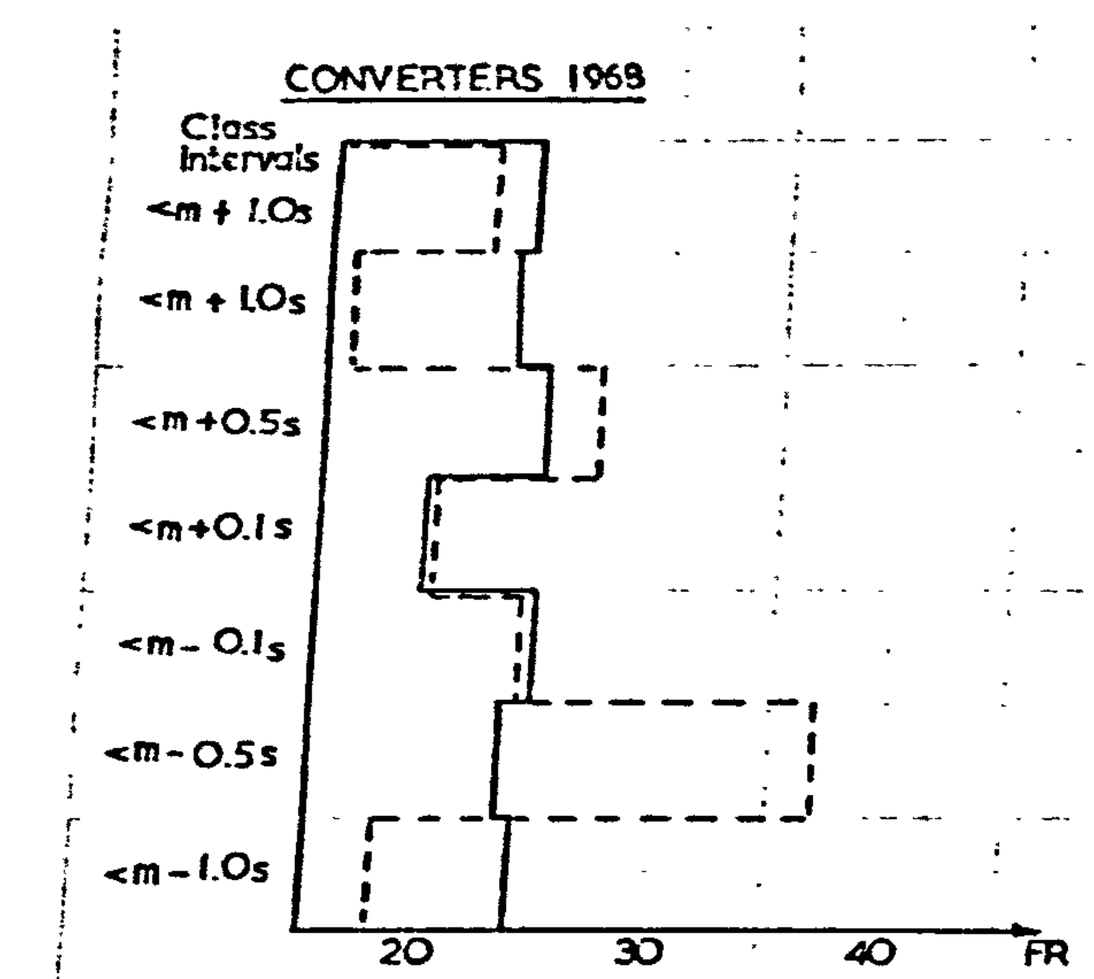
C.E.E. Direction Generale de la Concurrence
IV/A - 3 Tableaux de Concentration IV/45/74 - F

6. Test for Lognormality

An investigation was undertaken to determine how closely the distribution of the turnover of the converting companies approximated to the lognormal distribution. The number of manufacturing firms identified in the industry was too small to permit conventional tests of significance.

The mean *(m)* and standard deviation *(s)* of the logarithms of turnover were calculated and a frequency distribution with seven classes was generated on the basis of the ordinates of the normal distribution. A theoretical distribution of this kind was generated for 1968, 1970 and 1972. By this technique the actual distributions were found to differ appreciably in lognormality. Fig. 5 below compares the frequency observed from the data with the expected frequency for each size range.

The difference between the actual and theoretical distributions was found by the χ^2 test to be significant at the 2% level in 1968 and at the 1% level in 1970 and 1972.


CONVERTERS 1968
Class Intervals
<m + 1.0s
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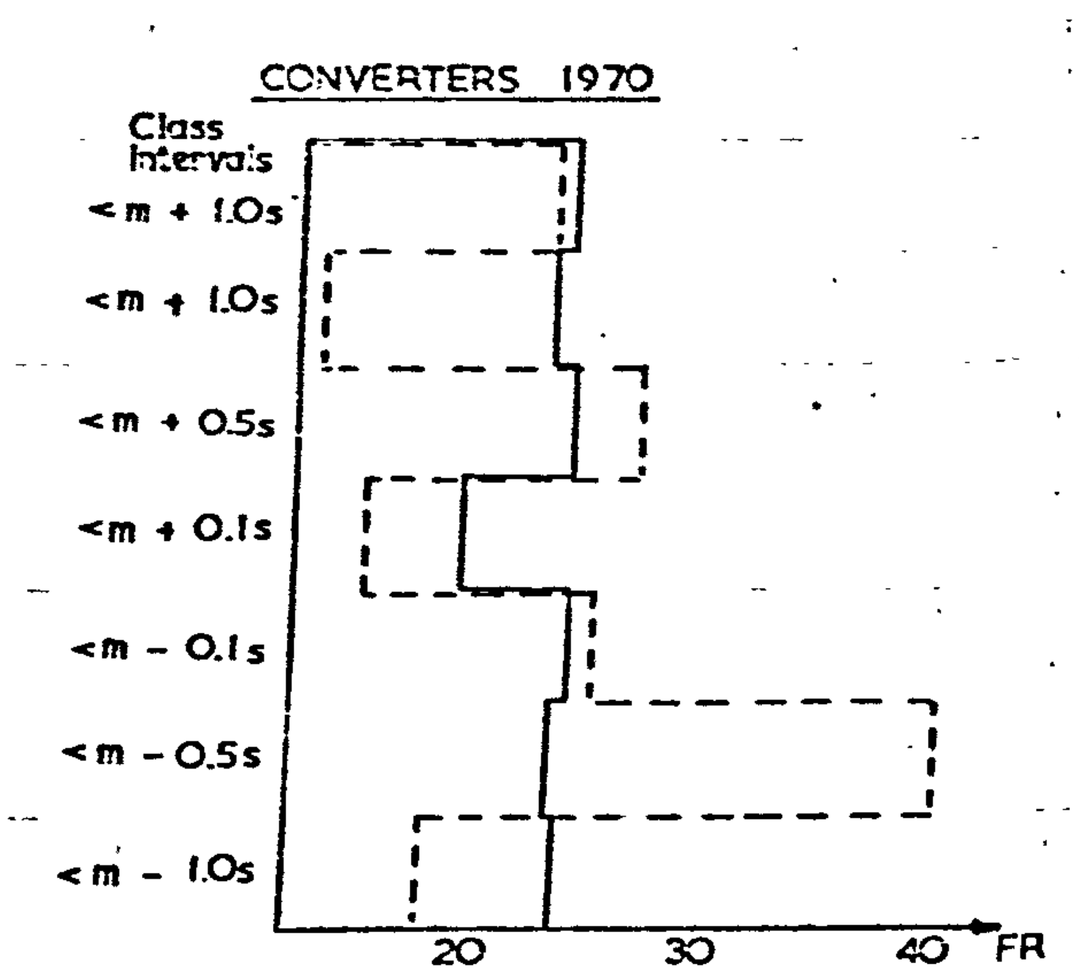
<m+0.5s
<m+0.1s
<m- 0.1s
<m-0.5s
<m-1.0s
20
30
40
FR


CONVERTERS 1970
Class Intervals
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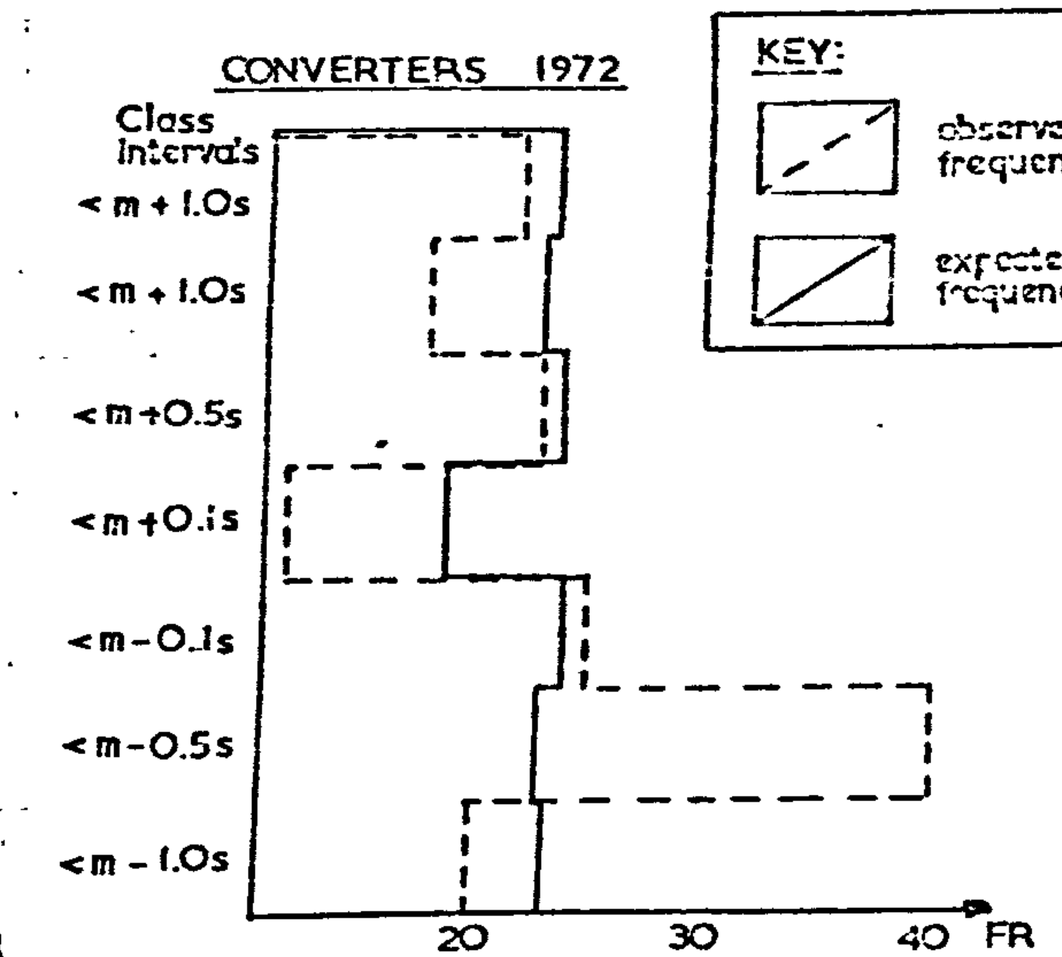
CONVERTERS 1972
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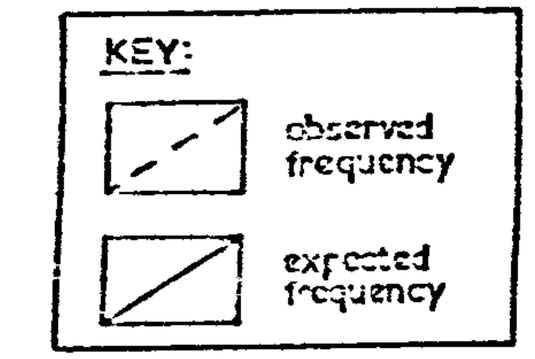
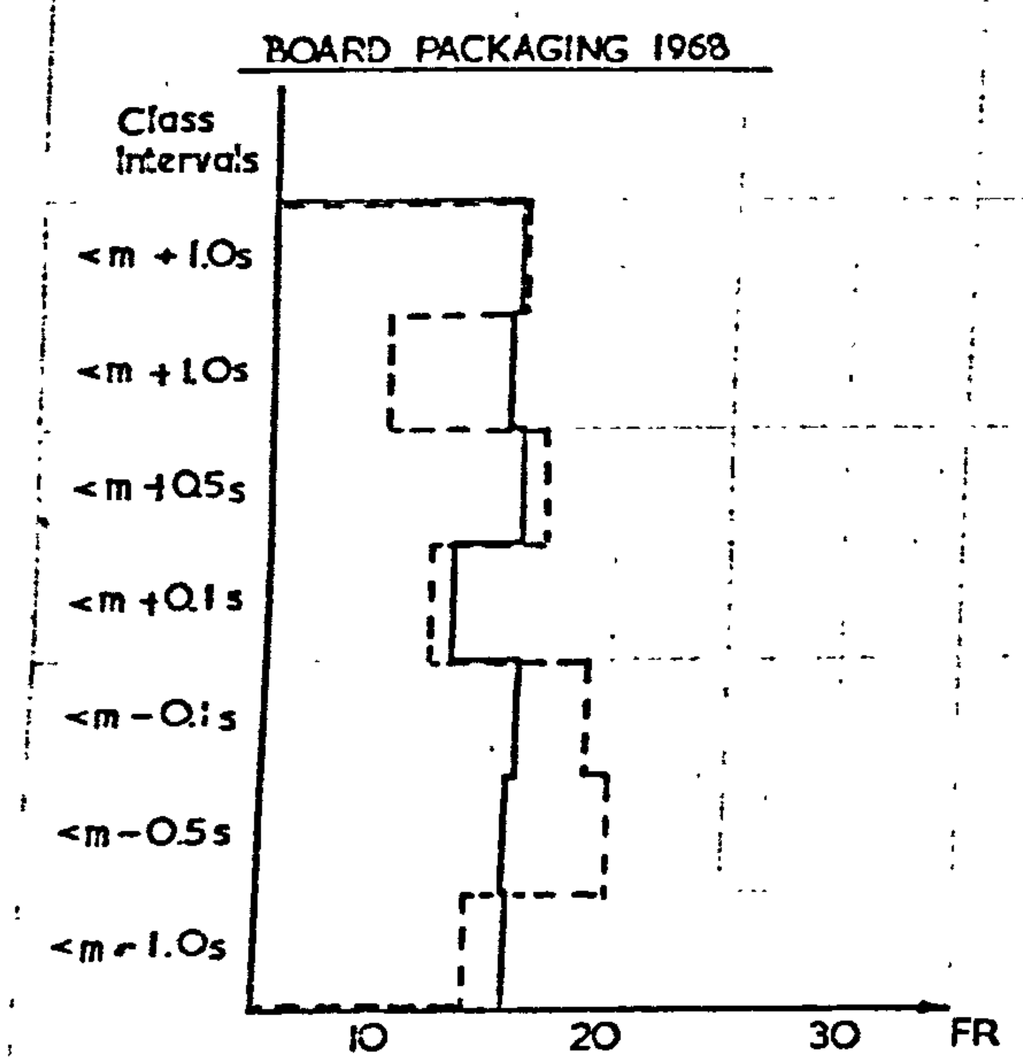

KEY:
observed frequency
expected frequency


BOARD PACKAGING 1968
Class Intervals
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<m + 1.0s
<m +0.5s
<m +0.1s
<m -0.1s
<m -0.5s
<m -1.0s
10
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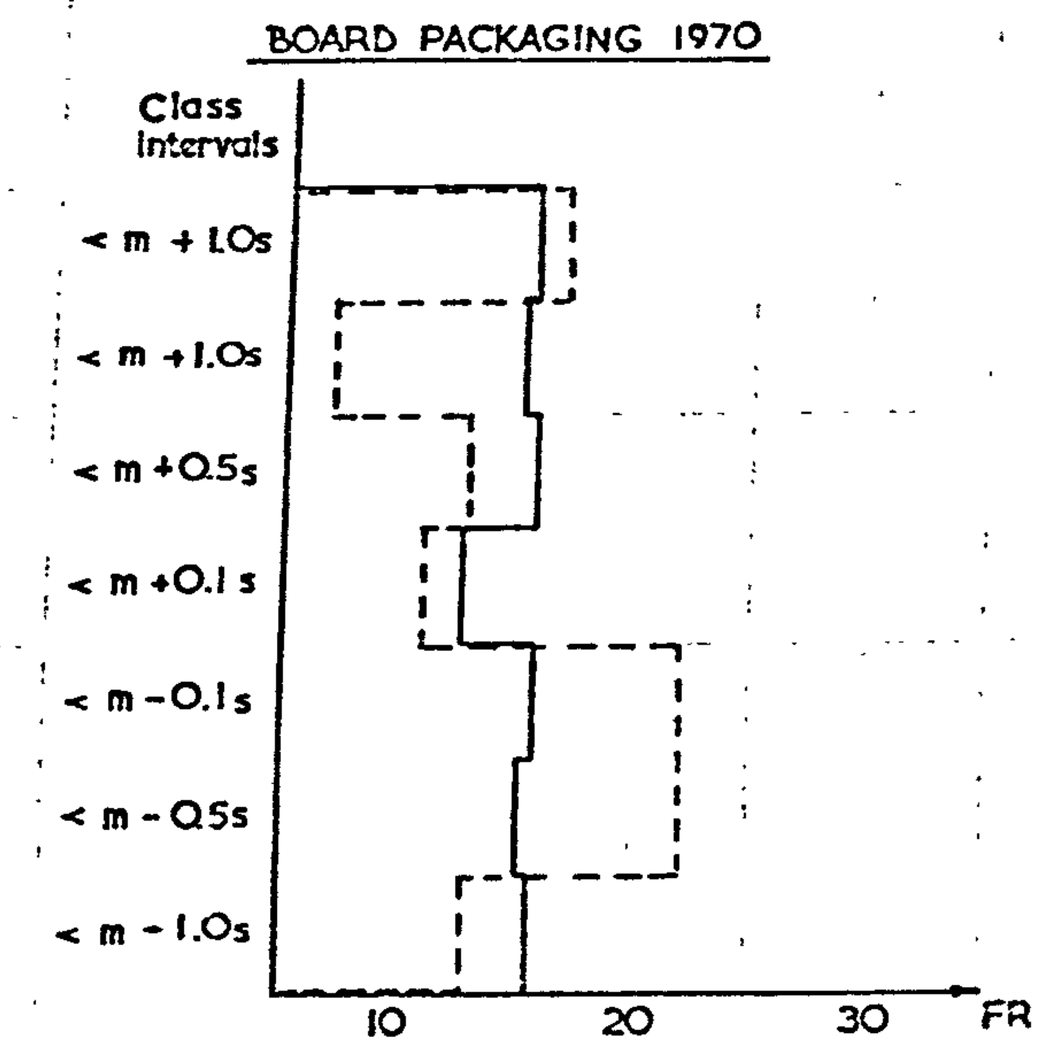
30
FR


BOARD PACKAGING 1970
Class Intervals
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< m +1.0s
< m +0.5s
< m +0.1 s
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< m -0.5s
< m -1.0s
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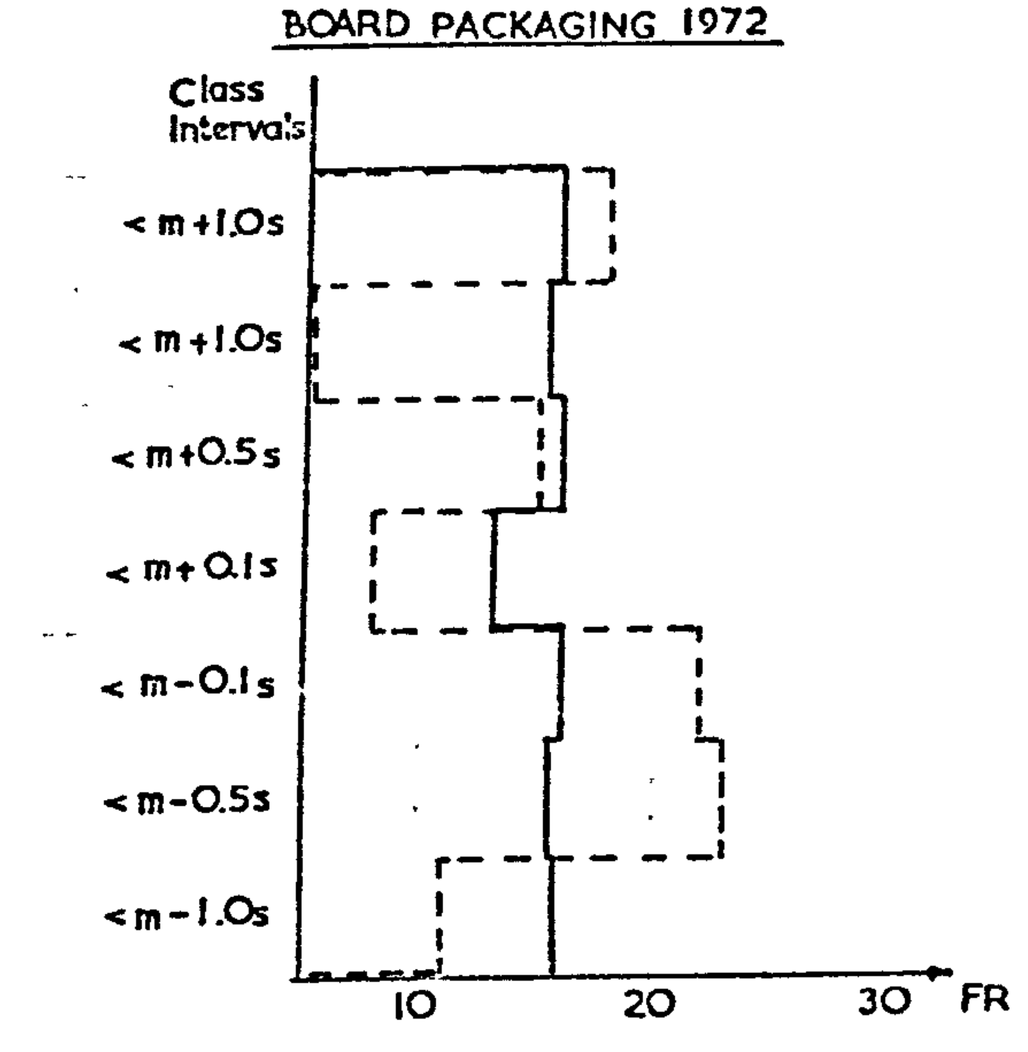
FR


BOARD PACKAGING 1972
Class Intervals
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< m +1.0s
< m+0.5s
< m+0.1s
< m-0.1s
< m-0.5s
< m-1.0s
10
20
30
FR

FIG. 5

7. The Pattern of Ownership

An analysis was undertaken to determine the relative numbers of public companies and private companies in the industry in the most recent year, 1972. Those organisations which form part of larger diversified conglomerates were classified as public companies if the parent company was publicly owned; and vice versa when the parent company was privately owned.

To avoid problems of vertical integration, the manufacturing and converting sectors were considered together.

41 of the 211 organisations in the industry are public companies. Of the 37 "multi-enterprise" companies referred to earlier, only 5 are privately owned. Although they represented only about 20% of the total number of organisations, public companies accounted for 85% of the total "own capital" of the industry in 1972.

For data relating to the same year, 1972, a further analysis of the incidence of interlocking directorates within the companies classified to the paper industry was undertaken. In the first instance the analysis was confined to the larger companies. No common directorates were revealed. This was assumed to be indicative of the pattern throughout the industry and the analysis was discontinued.

Changes of ownership of firms in the industry during the period 1968-1972 are recorded in the table below.

TAKEOVERS 1968-1972: MANUFACTURERS

Company	Equity £'000	First Owner	Year of Change	Second Owner
Allan B. Carlisle & Sons Ltd.	8	Independent	1969	Brittains Ltd.
Leonard Stace Ltd.	169	Independent	1969	Associated Paper Mills
Sterling Stubbins	328	Chartered co., USA	1970	S.I.L. Co., London
Bathford Paper Mills Co. Ltd.	94	Bathford & Ryburndale (Holdings) Ltd.	1971	Portals Holdings Ltd.
Ryburndale Paper Mills	67	Bathford & Ryburndale (Holdings) Ltd.	1971	Portals Holdings Ltd.

TAKEOVERS 1968-1972: CONVERTERS

Company	Equity	First Owner	Year of Change	Second Owner
C.P. Corrugated Cases Ltd.	580	Independent	1968	Tremlett Ltd.
Standard Box & Carton Co.	9	Independent	1969	Delyn Ltd.
Grove Mill Paper Co. Ltd.	1293	Lloyds Packing & Warehouses (Holdings)	1969	Capseals Ltd.
Browne & Day Ltd.	106	Independent	1970	Cundell Packaging (Holdings) Ltd.
Decoflex Ltd.	60	Independent	1970	Lamson Industries Ltd.
Brand Packaging	-	Melbray Print & Packaging	1971	Tremlett Ltd.
C. A. Coutts Ltd.	131	Bryant & May	1971	Cundell Packaging (Holdings) Ltd.
F. Morrell & Co.	45	G.U.S.	1972	McCleod Russell

ENTRANTS INTO THE INDUSTRY

Company	Equity £'000	Date	Sector
Integrated Packaging Ltd.	1	1968	Packaging
Sterling Stubbins Ltd.	75	1968	Tissue manufacturing
Brittains Arborfield Ltd.	405	1969	Paper manufacturing
Cundell Corrugated (Barnstable) Ltd.	-	1969	Packaging
Capseals Liners Ltd.	397	1969/70	Packaging
Fay International Ltd.	-	1970	Merchanting of paper goods
Dolan Corrugated Containers Ltd.	374	1970/71	Corrugated fibreboard containers
Brittains Paper Ltd.	1048	1971	Paper manufacturing
N & S Export Packers Ltd.	-	1971	Packaging materials manufacturing
Alf Cooke Bag Co. Ltd.	32	1972	Non-board packaging
Ruberoid Paper Co. Ltd.	625	1972	Paper manufacturing
Joseph Batchelor Ltd.	-	1972	Paper manufacturing

EXITS FROM THE INDUSTRY

W. R. Annan Ltd.	52	1969	Packaging
Chiltern Hunt	350	1969/70	Packaging
Chas. Sprenger & Sons Ltd.	36	1971	Packaging
Clyde Paper Co. Ltd.	-	1971	Paper manufacturing

Note: the tables record those companies for which evidence was found of incorporation or ceasation of trading during the period 1968-1972. Where accounts were not filed for 1972 and for other years, this was assumed to be due to the time lag involved in making the accounts available to the public.

SECTION 3. ANALYSIS OF MANUFACTURING PRODUCT GROUPS

1. Manufacture of printing + writing paper product group
2. Manufacture of packaging papers product group
3. Manufacture of board product group

SECTION 3

THE ANALYSIS OF MANUFACTURING PRODUCT GROUPS

Firms comprising the manufacturing sector of the paper and board industry (NICE 271) were considered to fall into three distinct non-competing groups:

printing and writing papers, incl. newsprint;
packaging papers, incl. tissues;
board making, incl. corrugated case materials.

The allocation of the individual firms into the relevant product groups was made with the help of information from trade associations; and with information from the firms themselves on the nature of the competition they experienced. Where the different subsidiaries of the same parent company manufacture for different product groups, then each subsidiary has been classified according to its own individual activity.

TABLE 14: NUMBERS OF COMPANIES CLASSIFIED TO EACH PRODUCT GROUP

Year	Printing & Writing Papers	Packaging Papers	Board Making
1968	27	19	20
1969	28	19	20
1970	29	20	20
1971	29	19	19
1972	29	19	20

An analysis of seller concentration in each of the separate product groups was undertaken. It was felt that an investigation of concentration amongst competing manufacturers provides a better description of the market conditions within that product group. The various concentration ratios used were calculated on the variable of turnover only. The use of this variable avoided the methodological difficulties outlined in Section 2.5 above.

The concentration indices calculated for each of the three product groups are summarised in the following tables, 15 and 16.

The following sub-sections, 3.1, 3.2 and 3.3 consider in greater detail the economic features and performance of each product group. This introductory section is intended to present some preliminary comparative conclusions relating to all of the manufacturing product groups.

Board manufacture requires different machinery from that used in paper manufacture. Manufacturers producing paper can feasibly switch production between print and writing papers and packaging papers, or produce a combination of the two. The manufacture of newsprint and soft tissue paper are further specialisations. Domestic newsprint production is effectively a duopoly, but does in fact represent less than half of total UK consumption. Tissue manufacture is a relatively new and compact industry, with at present only seven members registered with The British Paper and Board Industry Federation.

Tables 15 and 16 indicate that the level of concentration within each of the product groups as measured by the Gini Coefficient is similar. Between 1968-1972 the value of the Gini coefficient for packaging paper has remained constant, compared with the declining values over the same period within the printing and writing and board manufacturing product groups. This apparent fall in the level of concentration is most marked among the board manufacturers.

According to the Gini, Herfindahl-Hirschmann and Entropy indices, in each year, the degree of concentration was greatest in the packaging paper and least in the printing and writing product groups. For the printing and writing group, these indices changed little over the five year period, but for the other two groups it tended to decline. This decrease reflected reduced dispersion of turnover. The lower concentration indicated in the printing and writing group reflects the presence of about 50% more firms than in either of the other two groups.

Graphs showing the full series of concentration ratios and Linda indices can be found in the relevant sub-sections. Within the board manufacturing and packaging paper product groups, the concentration ratios at the beginning of the period at both 5 and 10 are similar. Again, the pattern of declining concentration among the board manufacturers over the period 1968-1972 is reflected in the value of the concentration ratio at 5 for this.

TABLE 15: ANALYSIS OF TURNOVER OF THE DIFFERENT MANUFACTURING PRODUCT GROUPS

COEFFICIENT OF VARIATION

Product Group	1968	1969	1970	1971	1972
Printing & Writing	1.79	1.86	1.90	1.87	1.89
Board Manufacture	2.00	1.88	1.80	1.70	1.72
Packaging Paper	2.09	2.05	2.00	1.96	1.93

GINI COEFFICIENT

Product Group	1968	1969	1970	1971	1972
Printing & Writing	0.68	0.70	0.69	0.67	0.66
Board Manufacture	0.73	0.71	0.70	0.68	0.67
Packaging Paper	0.72	0.73	0.72	0.72	0.72

HERFINDAHL-HIRSCHMANN INDEX

Product Group	1968	1969	1970	1971	1972
Printing & Writing	155.10	158.90	159.58	155.53	157.06
Board Manufacture	249.30	226.87	211.75	203.83	198.33
Packaging Paper	282.79	273.24	249.75	253.75	248.38

ENTROPY INDEX

Product Group	1968	1969	1970	1971	1972
Printing & Writing	-102.92	-102.17	-103.74	-106.21	-106.76
Board Manufacture	- 82.13	- 85.43	- 87.28	- 88.64	- 90.20
Packaging Paper	- 79.93	- 79.81	- 83.49	- 81.83	- 82.63

TABLE 16: ANALYSIS OF TURNOVER OF THE MANUFACTURING PRODUCT GROUPS

CONCENTRATION RATIO AT N* = 5

LINDA INDEX AT N* = 5

Year	1968	1969	1970	1971	1972
Printing & Writing	73.1 / 0.73	73.1 / 0.76	71.6 / 0.81	68.7 / 0.82	68.2 / 0.82
Board Manufacture	83.6 / 1.03	81.4 / 1.00	80.1 / 0.98	79.0 / 0.96	78.3 / 1.02
Packaging Paper	83.0 / 0.85	85.8 / 0.79	84.6 / 0.73	85.9 / 0.74	85.3 / 0.73

CONCENTRATION RATIO AT N* = 10

LINDA INDEX AT N* = 10

Year	1968	1969	1970	1971	1972
Printing & Writing	85.9 / 0.52	86.0 / 0.54	85.0 / 0.51	82.6 / 0.50	81.7 / 0.51
Board Manufacture	94.0 / 0.77	93.7 / 0.64	93.7 / 0.58	92.6 / 0.58	91.0 / 0.59
Packaging Paper	94.4 / 0.80	94.7 / 0.85	93.4 / 0.81	94.2 / 0.82	94.1 / 0.79

group. The comparatively lower level of concentration within the printing and writing product group is reflected in lower values of the concentration ratio at both the level of the first 5 and first 10 companies.

The Analysis of Performance

In Section 2, the performance of the UK paper and board industry was analysed in terms of the level of employment in each sector between 1968-1972. It was stated then that the more conventional performance measures of profit margin and return on equity could not be calculated for large sectors of an industry containing many companies not competing in similar product markets. At this stage of examining those individual product markets, performance can be more meaningfully analysed in terms of profitability and return on equity.

Tables 17 and 18 below show the mean and standard deviation of respectively profit margin and return on equity for each of the product groups identified. The ratios used were defined as follows:

$$\text{profit margin} = \frac{\text{profit before tax}}{\text{turnover}}$$

$$\text{return on equity} = \frac{\text{profit before tax}}{\text{shares + reserves}}$$

(Throughout the analysis, companies making losses in any year are included and the value of the loss computed as a negative profit. This allows a more satisfactory analysis of the variability in performance).

Tables 17 and 18 show a wide variation in the value of both the profit margin and return on equity, both from product group to product group, and for any product group, from year to year. This pattern of variability is especially marked in the analysis of profit margin. The measurement of standard deviation further reflects the enormous variability in the performance of each of the product groups.

TABLE 17: ANALYSIS OF PROFIT MARGIN

Mean profit margin / Standard deviation of profit margin	1968	1969	1970	1971	1972
Printing & Writing Paper	0.065 / 0.111	0.067 / 0.085	0.045 / 0.075	0.032 / 0.073	0.047 / 0.064
Board Manufacture	0.043 / 0.066	0.071 / 0.073	0.063 / 0.075	0.047 / 0.071	0.066 / 0.080
Packaging Paper	0.074 / 0.054	0.079 / 0.046	0.046 / 0.071	0.040 / 0.044	0.056 / 0.049

TABLE 18: ANALYSIS OF RETURN ON EQUITY

Mean return on equity / Standard deviation on return on equity	1968	1969	1970	1971	1972
Printing & Writing Paper	0.42 / 1.38	0.47 / 1.69	0.34 / 1.34	0.34 / 1.53	0.42 / 1.58
Board Manufacture	0.31 / 0.57	0.29 / 0 51	0.20 / 0.36	0.15 / 0.30	0.29 / 0.52
Packaging Paper	0.30 / 0.46	0.36 / 0.46	0.26 / 0.52	0.28 / 0.49	0.55 / 0.97

It was decided to examine further the wide dispersion in profit margins and returns on equity. To what degree did differences between companies occur consistently over the five year period?

In order to answer this question, five-year averages of profit margins and returns on equity were calculated for each firm. The coefficients of variation

$$\frac{\text{(Standard deviation)}}{\text{mean}}$$

of the five-year averages may be compared with those derived from the distribution containing individual figures for all of the five years:[9].

Coefficients of Variation

	(a) 5-year averages	(b) Individual figures for all 5 yrs.
PROFIT MARGINS		
Printing and writing	1.38	1.62
Board manufacturing	0.84	1.26
Packaging paper	0.55	0.91
RETURNS ON EQUITY		
Printing and writing	3.17	3.78
Board manufacturing	1.41	1.88
Packaging paper	1.24	1.75

These results show that consistent differences between firms in these two performance indicators account for most of the dispersion observed over the five-year period. Because of possible anomalies in the original figures (e.g. the valuation of capital) and certain assumptions made for the purposes of this report (e.g. in allocation of group figures between subsidiares), firm conclusions cannot be drawn from these findings. Further research would be necessary to verify this apparent divergence in profitability between firms before any attempt at explanation.

9. see next page.

One hypothesis which was investigated at some length was the relationship between profitability (measured by gross margins or by return on equity) and size. No significant regression results were derived from these investigations. No relationship was established either between gross margin on turnover and level of turnover or between return on equity and value of equity. This result is consistent with the nature of competition and specialisation within the industry, discussed at greater length in the following subsections. The results are presented in the table below.

REGRESSION ANALYSIS - VALUE OF R^2 COEFFICIENT

Product Group	Profit Margin / Turnover	Return on Equity / Equity
Printing & Writing	0.00062	0.01134
Board Manufacture	0.00647	0.03924
Packaging Papers	0.02796	0.04576

9.

(a) If the profit margin or return on equity in the year j is shown as r_j then the five-year average R is $(r_{68} + r_{69} + r_{70} + r_{71} + r_{72}) \div 5$

The coefficient of variation is $\frac{1}{\bar{R}} \sqrt{\frac{\Sigma (R-\bar{R})^2}{n-1}}$ where n is the number of firms

(b) The coefficient of variation based on individual figures is given by the following equation:

$$V = \frac{Sc}{Mc}$$

$$S_c = \frac{n_{68}s_{68}^2 + n_{69}s_{69}^2 + n_{70}s_{70}^2 + n_{71}s_{71}^2 + n_{72}s_{72}^2}{n_{68} + n_{69} + n_{70} + n_{71} + n_{72}}$$

$$M_c = \frac{n_{68}m_{68} + n_{69}m_{69} + n_{70}m_{70} + n_{71}m_{71} + n_{72}m_{72}}{n_{68} + n_{69} + n_{70} + n_{71} + n_{72}}$$

and for each year

$$S = \sqrt{\frac{\Sigma(r - \bar{r})^2}{n-1}}$$

$$m = \bar{r} = \frac{\Sigma r}{n}$$

SECTION 3: SUB-SECTION 1

MANUFACTURE OF PRINTING & WRITING PAPER PRODUCT GROUP

Included within this product grouping are those firms manufacturing printing and writing paper (incl. coated) and newsprint.

In terms of domestic consumption, newsprint represents the greater usage by weight. However, domestic production of printing and writing paper has in recent years almost doubled that of newsprint. The shortfall is covered by imports. Production of both types of paper has been falling since about 1969/70 and in both cases imports represent an increasing proportion of consumption. However, as Table 19 below indicates, imports of newsprint account for over 50% of consumption, but less than30% of printing and writing paper consumption.

Financial statistics relating to those firms identified in the product group are shown in Table 20. The values shown are at prices prevailing at the time of recording, but even without correcting for inflation it is possible to identify the fall in total net cash flow of the firms in the product group during the period.

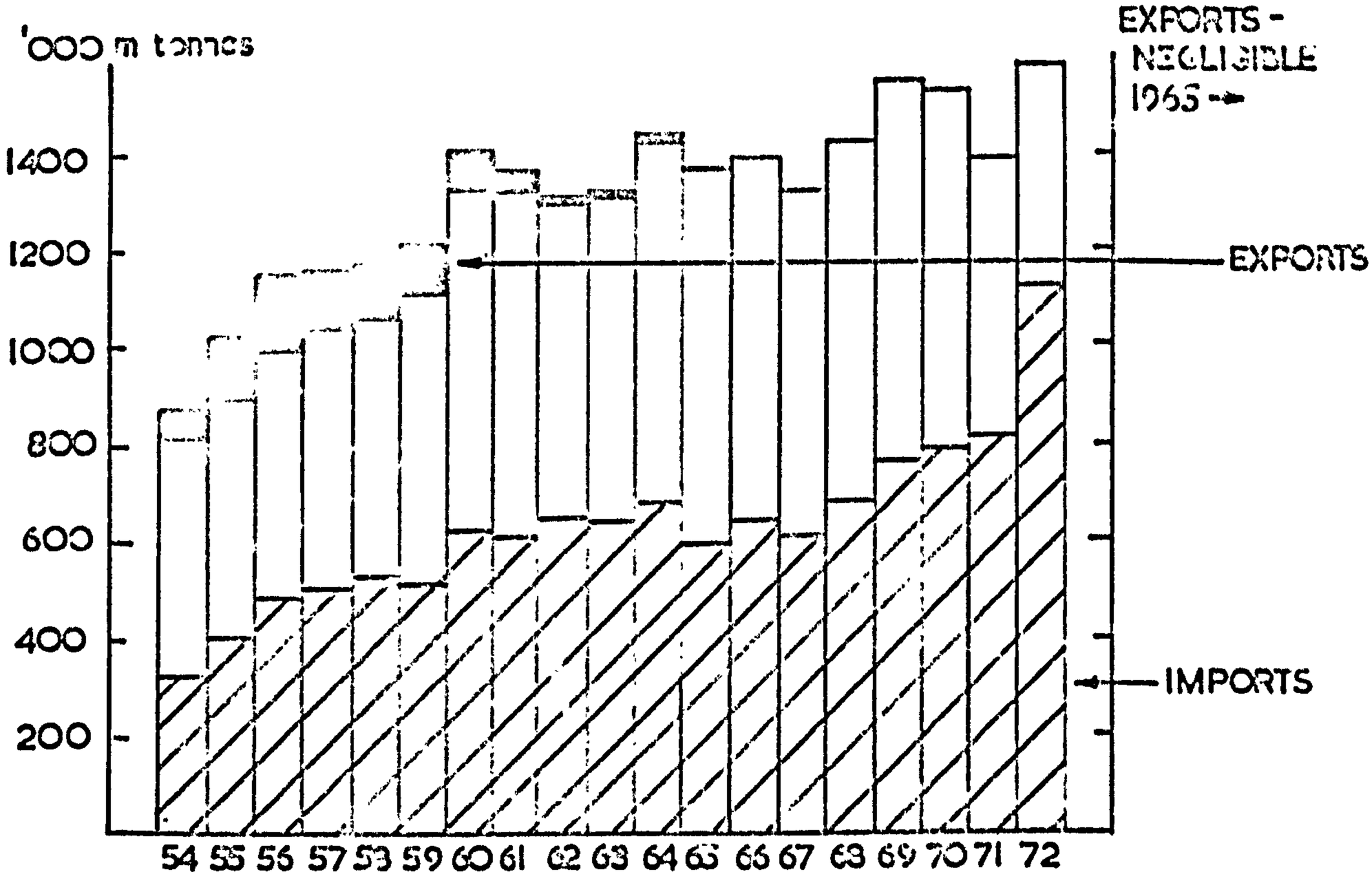
The large firms in this section of the paper industry during the period 1968-1972 were Bowaters, Reed International, Wiggins Teape and Inveresk Paper Company.

Of these companies, Bowater and Reeds have an effective duopoly of newsprint manufacture. However, UK manufacturers supply less than 50% of newsprint usage, the remainder being imported from Canada and Scandinavia.

Printing papers are used by printers for book publishing and production of periodicals, brochures, etc. Writing papers are used for personal stationery and office stationery. Paper mills traditionally sell to their customers through merchants or directly to printers and wholesalers: few manufacturing mills have their own merchanting companies.

Characteristically, paper mills rely on regular customers, producing often on contract and to specification for large orders. The major part of orders is supplied from stock. However, as previously stated, the

TABLE : 19 APPARENT CONSUMPTION — NEWSPRINT



APPARENT CONSUMPTION — PRINTING AND WRITING PAPERS Incl.coated.

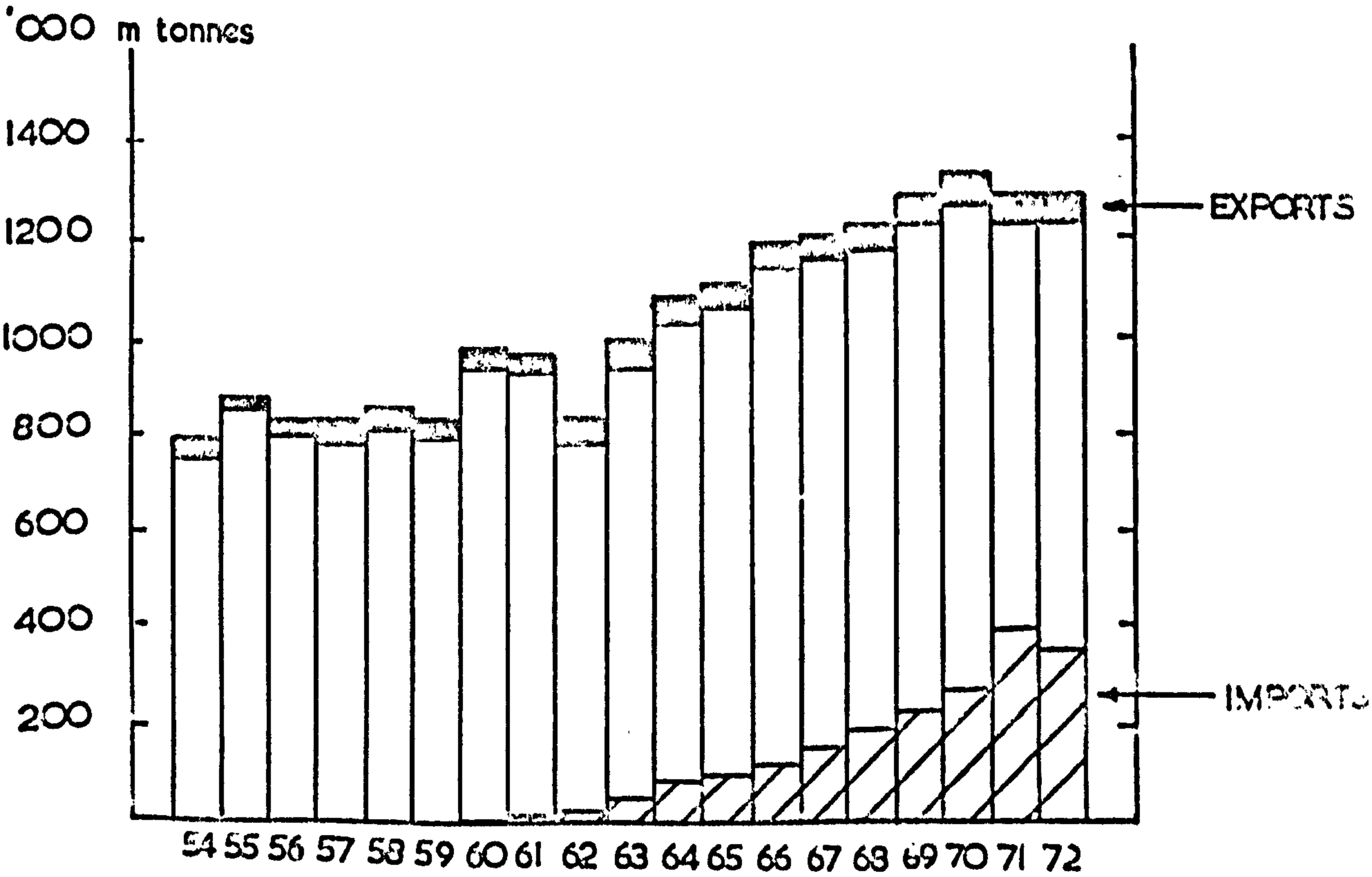


TABLE 20: FINANCIAL STATISTICS OF COMPANIES IDENTIFIED IN PRINTING & WRITING PRODUCT GROUPS

Year	Number of Companies	Total Turnover	Total Exports	Pre-Tax Profits	Total Net Cash Flow	Total Equity	Total Annual Investment
1968	27	254,549	15,277	18,356	20,160	159,172	14,546
1969	28	286,353	15,850	16,920	20,300	171,522	19,426
1970	29	317,942	20,988	12,783	17,904	172,478	17,473
1971	29	311,203	22,719	11,333	18,125	166,025	26,017
1972	29	347,966	24,848	10,095	18,048	174,956	17,107

largest firms within the product group are part of larger vertically integrated companies and fluctuations on the demand side have a lesser influence. These large firms appear to be price leaders in the ordinary, bulk grades where other smaller mills are making the same grades. However, smaller mills can be equally profitable if they produce specialty papers in smaller runs tailor-made to the customers' exact requirements. In fact, the long-run future of the industry is seen to be in those products with a high "value added", since it is anticipated that it will become increasingly difficult for UK mills to compete on ordinary bulk grades with lower cost producers such as Sweden and Finland, as was discussed earlier in Section 2.

Structure

Table 21 shows the asset structure of the product group. Paper manufacturing is a capital intensive industry. In recent years the low rate of return (see Tables 17 and 18) has provided little incentive for new entrants into the industry, or for significant takeovers and mergers in the period under consideration: one major exception was the takeover in 1970/71 of Wiggins Teape Ltd. by the large diversified conglomerate, British American Tobacco.

TABLE 21: ASSET STRUCTURE OF FIRMS IDENTIFIED IN PRINTING AND WRITING PRODUCT GROUP

Own Capital (£'000)	No. of firms 1968	No. of firms 1972
0 - 50	1	1
51 - 500	6	5
501 - 1,000	5	4
1,001 - 10,000	11	14
10,001 - 20,000	2	2
20,001 - 50,000	1	1
50,001 - 100,000	1	1
	27	28

Between 1968-1972 the product group has been fairly static, with most firms surviving, but with reduced profits in later years. Declining liquidity and failure to produce new investment in real terms may be an indication of future rationalisation.

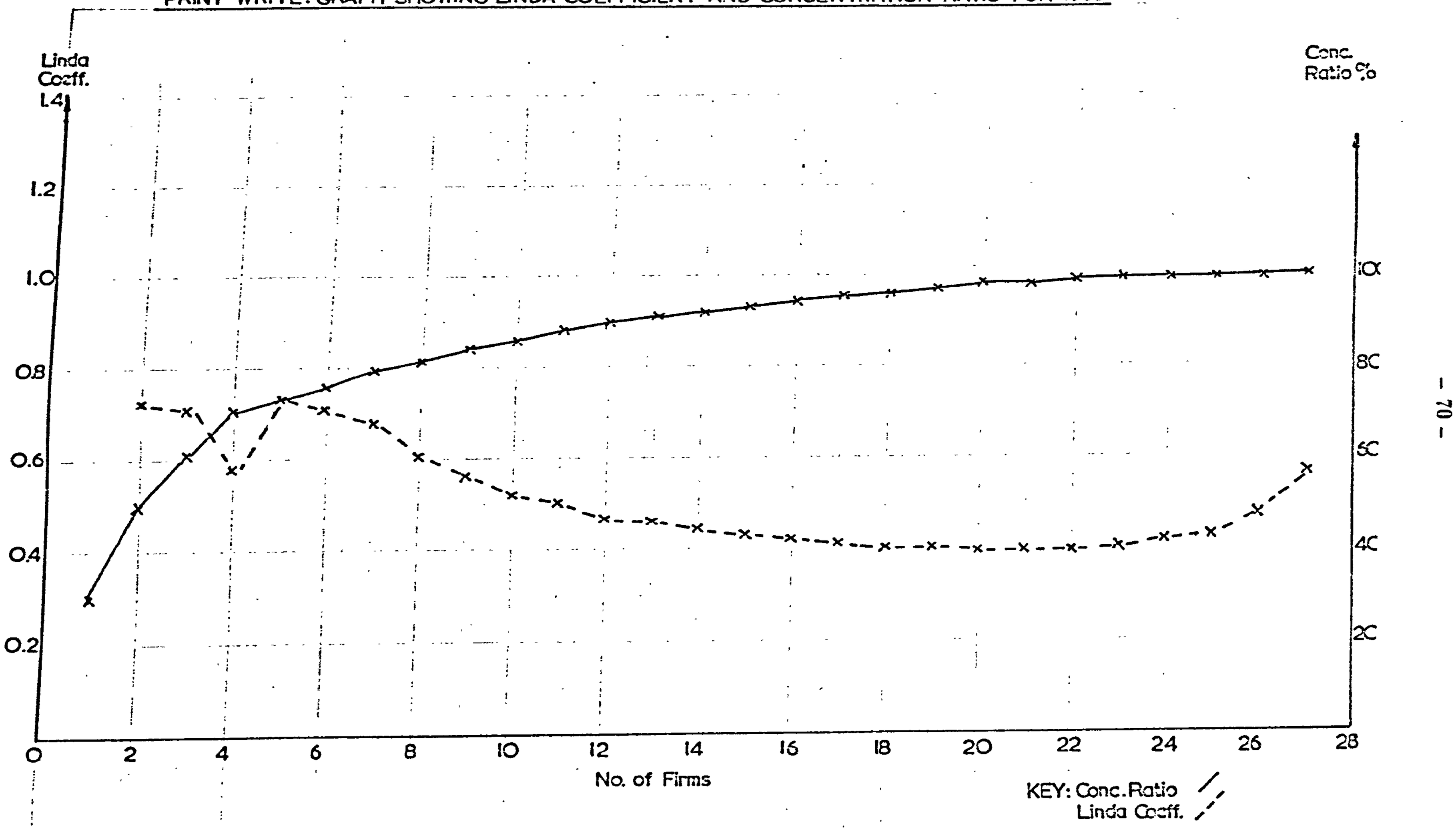
The analysis of concentration in terms of turnover shown in Table 22 reflects the situation within the product group. Each of the indices has remained fairly static between 1968-1972. The importance of the largest producers is reflected in the concentration ratios and Gini coefficient. A high variability of size of turnover would not be expected in such a capital intensive sector of the industry.

The graphical representation of the concentration and Linda indices shows the four largest firms forming a distinct oligopolistic group. In 1972 their respective shares of all sales by UK producers were 30%, 20%, 11% and 9%; the sales of the fifth largest company represented only 3% of total sales. Once again, this oligopoly situation must be considered against the background of competition from imported papers; the four firms' combined share of the UK market is of the order of 40-50%.

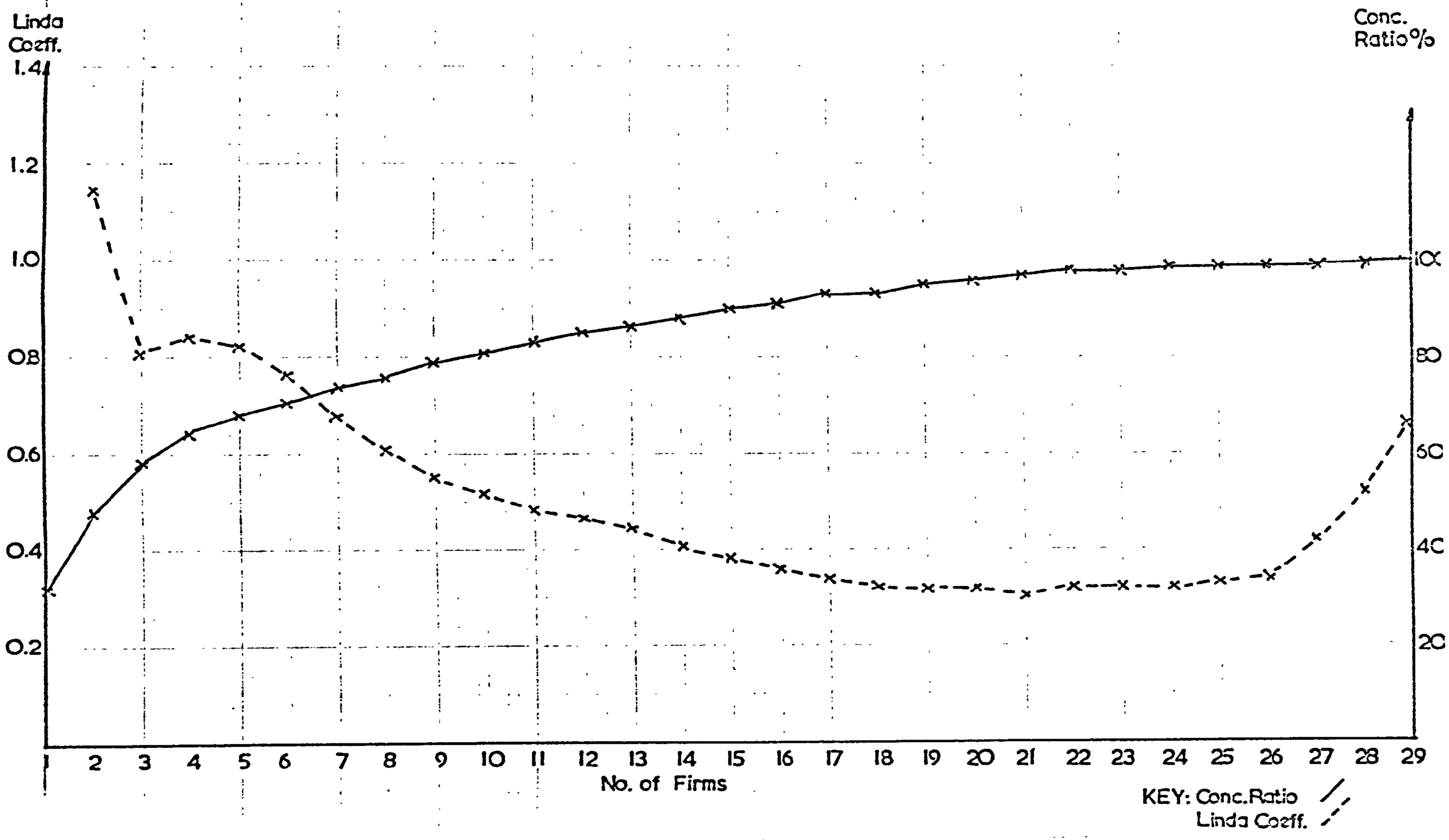
TABLE 22: PRINTING & WRITING PAPER, ANALYSIS OF TURNOVER

	1968	1969	1970	1971	1972
No. of Companies	27	28	29	29	29
Total Turnover ('000)	254,549	286,440	318,037	311,377	348,096
Mean	9427.741	10230.00	10966.793	10737.138	12003.310
Coefficient of Variation	1.785	1.857	1.904	1.873	1.885
Gini	0.679	0.695	0.690	0.668	0.658
Herfindahl-Hirschmann	155.099	158.898	159.580	155.526	157.059
Entropy	-102.918	-102.166	-103.736	-106.211	-106.763
Linda Index for N* / Concentration Ratios %					
= 2	0.724 / 50.00	0.699 / 51.36	0.869 / 50.4	1.09 / 48.1	1.14 / 48.3
= 5	0.727 / 73.1	0.757 / 73.1	0.810 / 71.6	0.81 / 68.7	0.82 / 68.1
= 10	0.523 / 85.8	0.536 / 86.0	0.507 / 84.9	0.49 / 82.6	0.50 / 81.6
= 15	0.429 / 93.2	0.433 / 93.3	0.424 / 92.1	0.38 / 90.8	0.37 / 90.0
= 20	0.394 / 97.5	0.400 / 97.9	0.364 / 97.3	0.31 / 96.9	0.30 / 96.5
= 27	0.568 / 100.0	0.623 / 99.9	0.478 / 99.9	0.48 / 99.8	0.41 / 99.9

PRINT WRITE: GRAPH SHOWING LINDA COEFFICIENT AND CONCENTRATION RATIO FOR 1968



PRINT WRITE: GRAPH SHOWING LINDA COEFFICIENT AND CONCENTRATION RATIO FOR 1972



SECTION 3: SUB-SECTION 2

MANUFACTURE OF PACKAGING PAPERS PRODUCT GROUP

Included within this product grouping are those firms manufacturing packaging papers and tissue paper. Packaging papers are used extensively in the wrapping of food and other products. Tissue manufacture includes both hard and soft tissue varieties.

Until 1963 the UK market for tissues was shared by Kimberly-Clark and Scott Paper of the USA., the latter being linked with the British company, Bowater. In 1963 their position was challenged by Peter Dixon, Inveresk, Wiggins Teape and Satinex. At the beginning of 1966, a Swedish pulp producer acquired a controlling interest in Satinex and its name was subsequently changed to Modo Consumer Products. In 1967 the tissue interests of Peter Dixon, Inveresk and Associated Tissues were merged to form British Tissues.

During the period under consideration tissue manufacture remained a compact industry. In 1973 the British Paper and Board Industry Federation had seven members registered as tissue manufacturers. Four of these members can be considered to be completely vertically integrated, both manufacturing and converting the tissue to its final form.

Tissue firms, being in a relatively newer sector of the paper industry, possess comparatively newer machinery and hence the need for replacement investment is less critical.

In many ways, mills producing packaging papers exhibit similar economic characteristics to those discussed in relation to manufacturers of printing and writing papers. Table 23 shows the financial statistics relating to companies identified in the group. The asset structures of the two sectors shown in Table 24 are similar, reflecting the common technology and production methods.

TABLE 23: FINANCIAL STATISTICS OF FIRMS IDENTIFIED WITHIN THE MANUFACTURE OF PACKAGING PAPER PRODUCT GROUP

£'000

YEAR	NUMBER OF COMPANIES	TOTAL TURNOVER	TOTAL EXPORTS	PRE-TAX PROFITS	TOTAL NET CASH FLOW	TOTAL EQUITY	TOTAL ANNUAL INVESTMENT
1968	19	123,220	2,408	8,103	8,148	56,193	7,553
1969	19	138,621	3,195	9,626	9,455	56,484	9,276
1970	20	151,489	3,706	6,177	8,002	56,316	13,971
1971	19	150,469	3,893	3,498	5,948	52,521	9,650
1972	19	158,458	4,211	7,254	10,068	50,713	4,230

TABLE 24: COMPARATIVE ASSET STRUCTURES OF PACKAGING PAPER AND PRINTING AND WRITING PRODUCT GROUPS

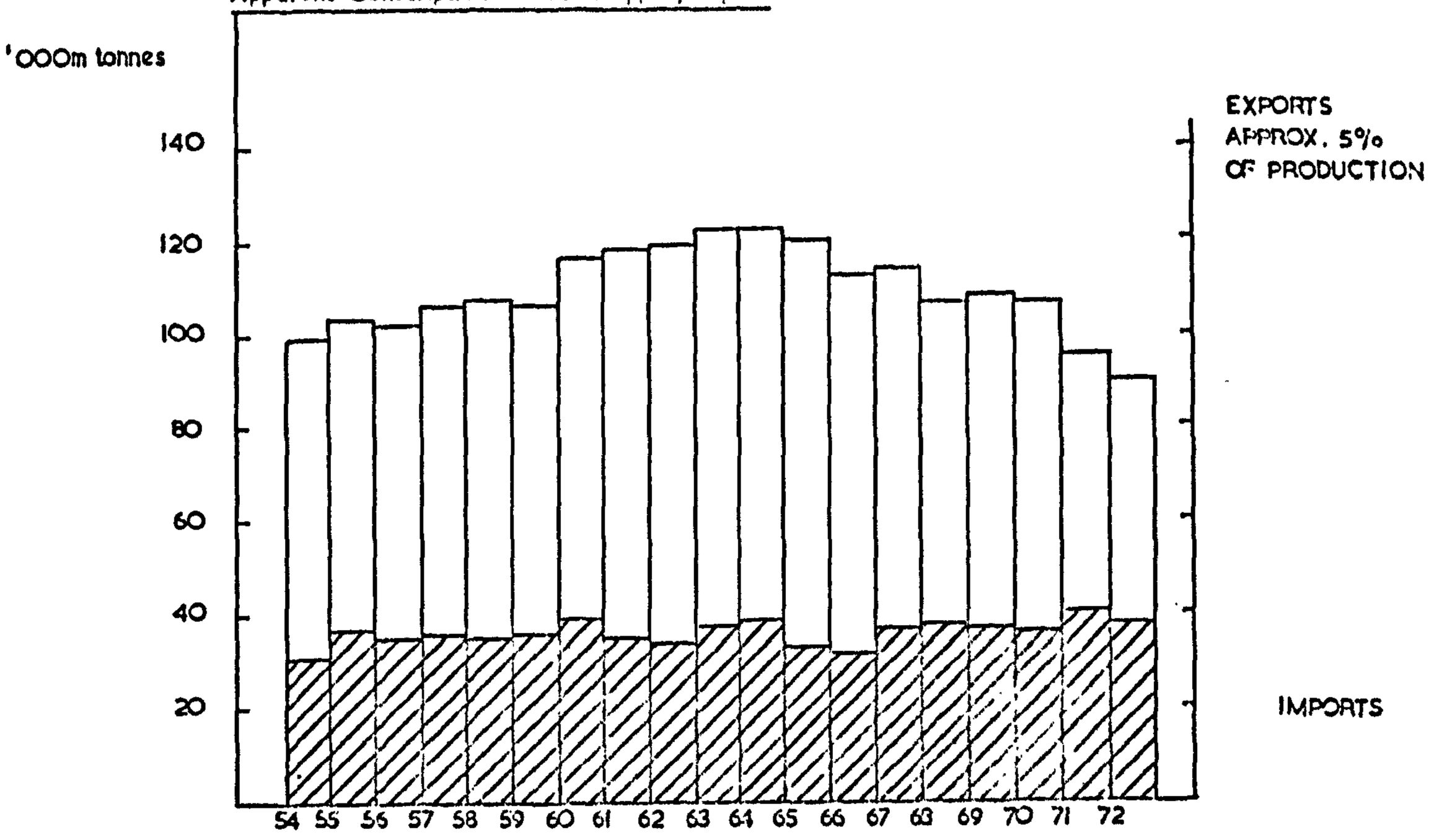
Own Capital (£'000)	Packaging Paper No. of firms		Printing & Writing No. of firms	
	1968	1972	1968	1972
0 - 50	2	1	1	1
51 - 500	7	9	6	5
501 - 1,000	2	2	5	4
1,001 - 10,000	7	6	11	14
10,001 - 20,000	0	0	2	2
20,001 - 50,000	1	1	1	1
over 50,000			1	1
	19	19	27	28

Production and trade statistics relating to packaging paper manufacture are shown in Table 25. Domestic production of packaging papers represents approximately 30% of consumption; imports accounted for the bulk of consumption. During the five-year period imports of kraft wrapping paper increased by almost 20%. Imports of other wrapping papers have remained more static.

This large volume of imports reduces the significance of concentration indices as indicators of market structure. Table 26 shows the concentration indices calculated for the product group on the basis of turnover. The size distribution of the sales by UK firms of packaging papers is fairly similar to that of sales of printing and writing papers. Apart from the entropy index, each of the measures suggests a slightly higher degree of concentration (the entropy index is affected more than the other measures by the greater number of companies). The graphical representation of the concentration ratios and Linda indices shows an "oligopoly" group of six firms with 88% of all UK sales, in 1968. In 1972 the minimum value of the Linda occurs at the fifth firm indicating a loss in its share of the market by the sixth firm.

TABLE 25

Apparent Consumption - Food Wrapping Papers



Apparent Consumption - Kraft Wrapping Papers

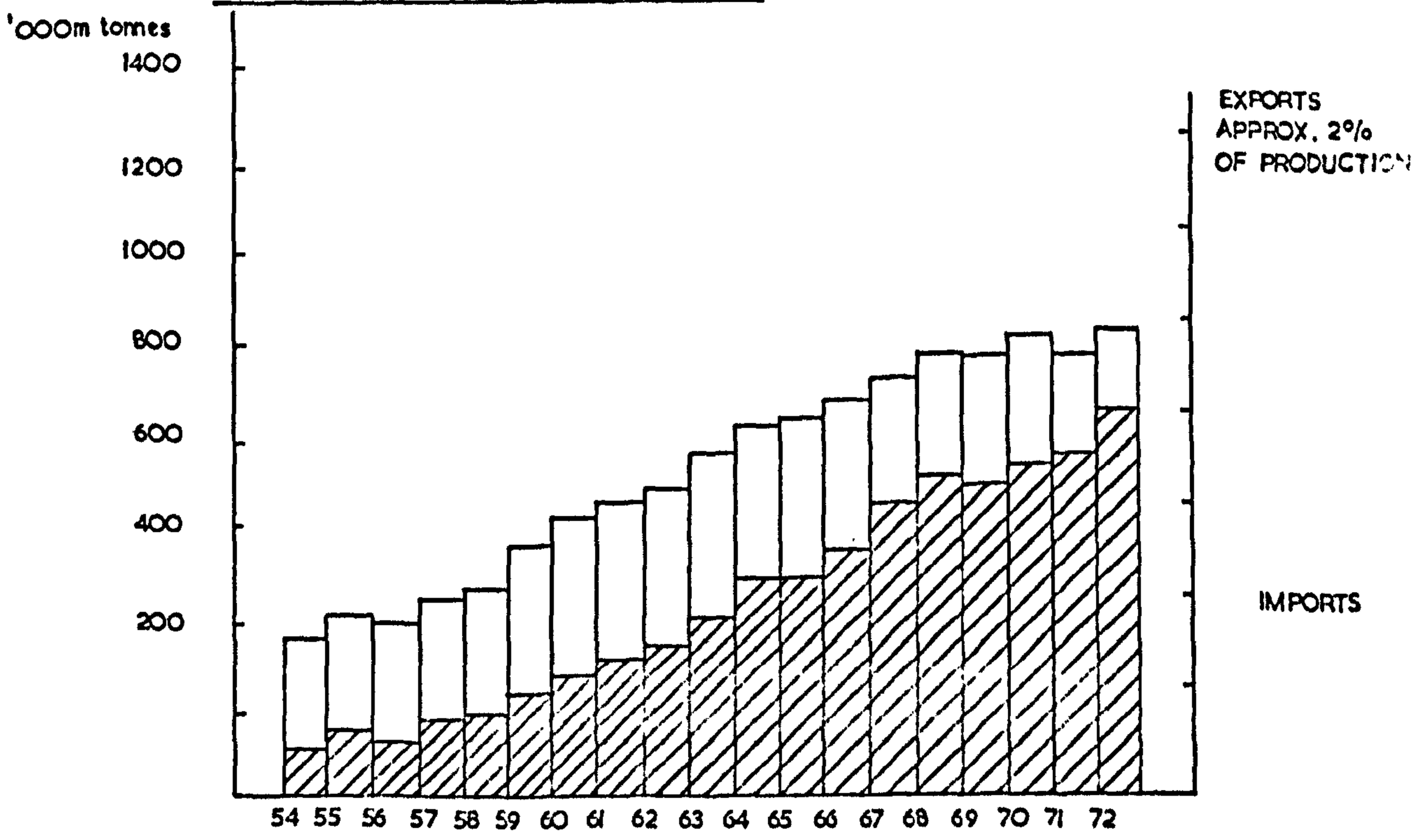
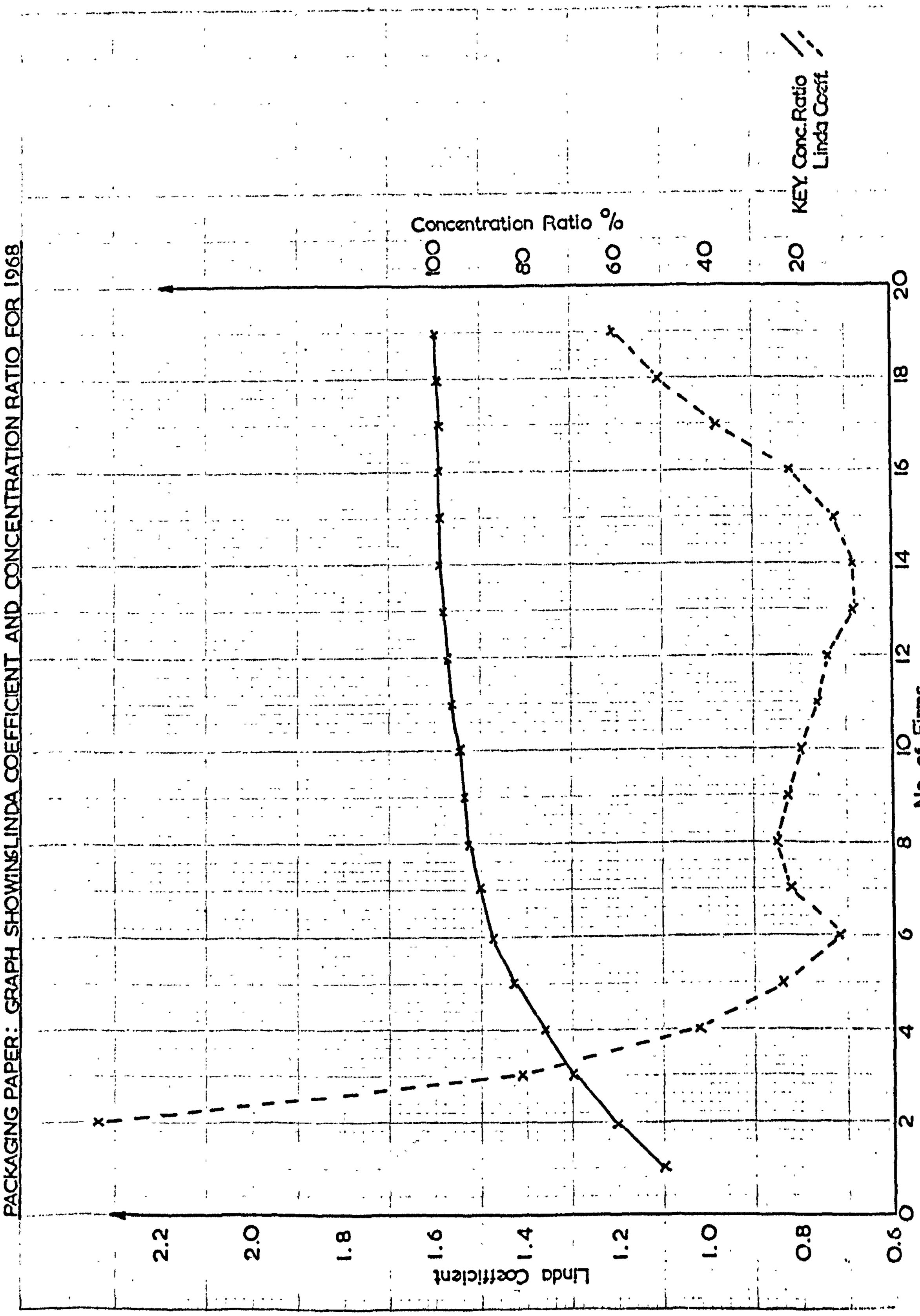
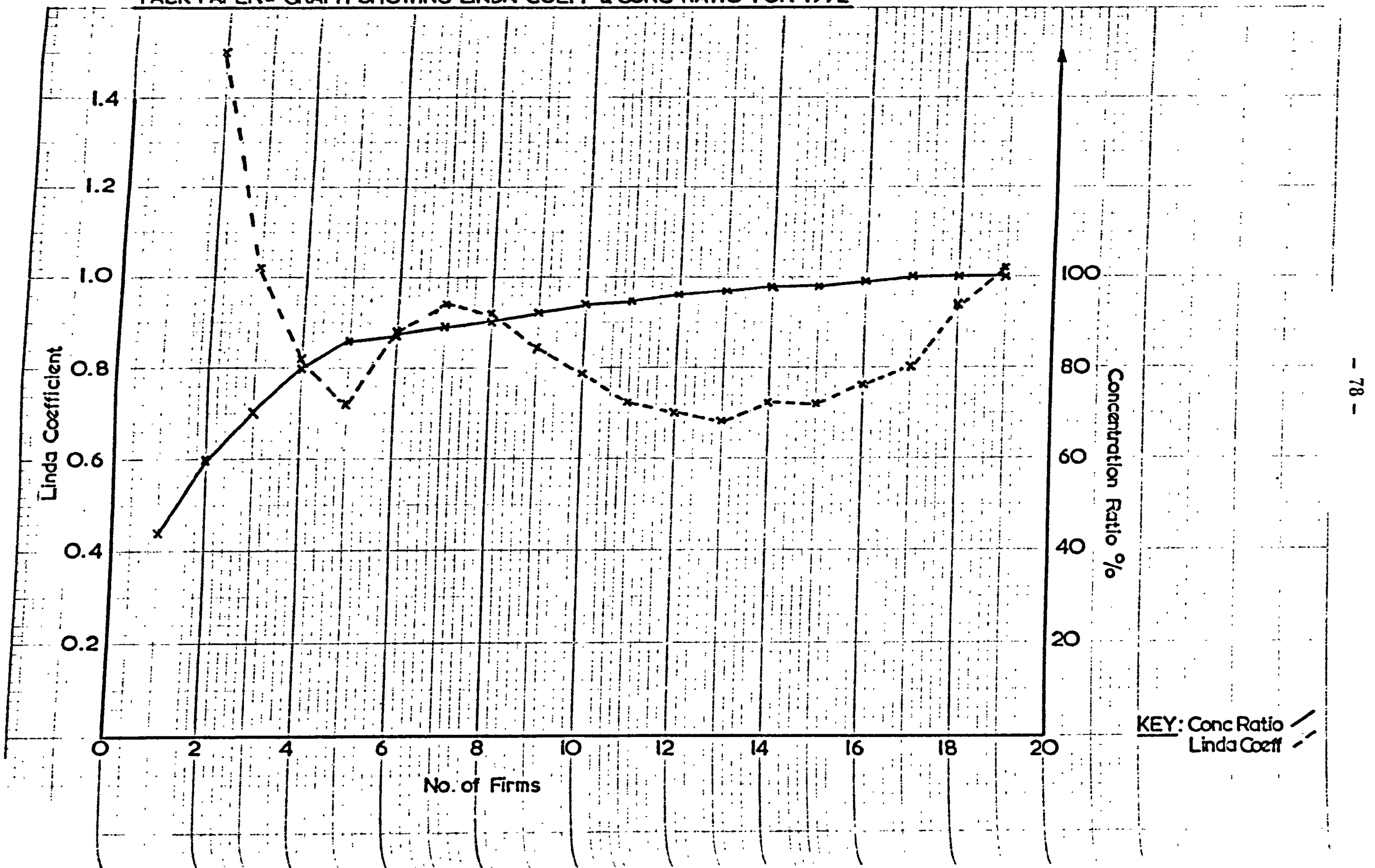


TABLE 26: PACKAGING PAPER, ANALYSIS OF TURNOVER

	1968	1969	1970	1971	1972
No. of Companies	19	19	20	19	19
Total Turnover ('000)	123,220	138,621	151,489	150,469	158,458
Mean	6485.26	7295.84	7574.45	7919.421	8339.89
Coefficient of Variation	2.091	2.04	1.998	1.954	1.928
Gini	0.722	0.729	0.720	0.720	0.716
Herfindahl-Hirschmann	282.789	273.24	249.751	253.751	248.375
Entropy	-79.930	-79.815	-83.492	-81.825	-82.628
Linda Index for N* / Concentration Ratios %					
= 2	2.33 / 60.7	1.96 / 60.5	1.80 / 58.0	1.62 / 59.5	1.50 / 59.7
= 5	0.84 / 82.9	0.79 / 85.8	0.72 / 84.6	0.73 / 85.8	0.72 / 85.3
= 10	0.80 / 94.4	0.85 / 94.6	0.81 / 93.4	0.82 / 94.2	0.79 / 94.0
= 15	0.71 / 99.3	0.75 / 99.2	0.66 / 98.6	0.72 / 98.9	0.71 / 98.9
	/	/	/	/	/
	/	/	/	/	/
	/	/	/	/	/
	/	/	/	/	/
	/	/	/	/	/


PACKAGING PAPER: GRAPH SHOWINGLINDA COEFFICIENT AND CONCENTRATION RATIO FOR 1968
Concentration Ratio %
100
80
60
40
20
KEY Conc.Ratio
Linda Coeff.
Linda Coefficient
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
No. of Firms
20
18
16
14
12
10
8
6
4
2
0

PACK PAPER = GRAPH SHOWING LINDA COEFF & CONC RATIO FOR 1972



SECTION 3: SUB-SECTION 3

MANUFACTURE OF BOARD PRODUCT GROUP

Board manufacture may be considered in two sectors:

(i) packaging board;
(ii) specialty and other board (excl. building board).

Domestic production of board has been fairly static, but since 1967/68 has begun to decline. Imports represent approximately 25% of consumption of packaging boards and approximately 15% of consumption of other boards. Production and trade statistics are shown in Table 27.

The manufacture of packaging boards is characterised by a small number of large units, usually all having converting interests. Specialty board makers tend to be fewer in number and often produce for specialised converted products, e.g. plaster board, boards for the motor industry, shoe industry, etc. Table 28 presents the financial statistics relating to the firms in the industry. Table 29 below shows the asset distribution of the firms in the industry.

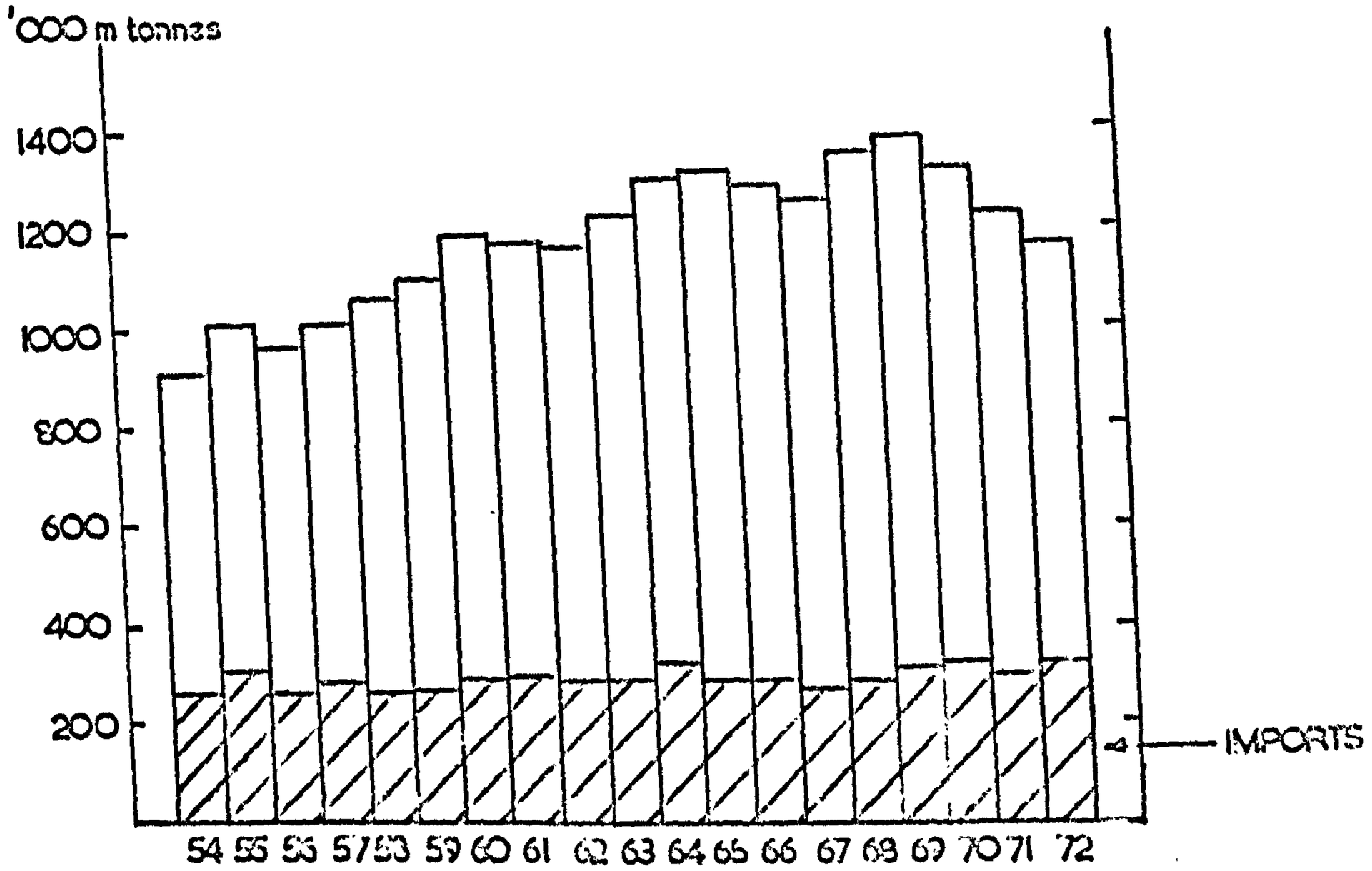
TABLE 29: ASSET STRUCTURE OF FIRMS IDENTIFIED IN BOARD MANUFACTURING PRODUCT GROUP

Own Capital (£'000)	No. of Firms 1968	No. of Firms 1972
0-50	3	0
5-500	7	9
50-1,000	3	3
100-10,000	6	6
1,000-20,000	1	1
over 20,000	0	1

Table 29 illustrates the capital intensive nature of the product group compared with other sectors of the paper industry: in 1972 there were no firms with own capital less than 50,000.

TABLE 27

APPARENT CONSUMPTION — PACKAGING BOARDS



APPARENT CONSUMPTION — OTHER BOARDS

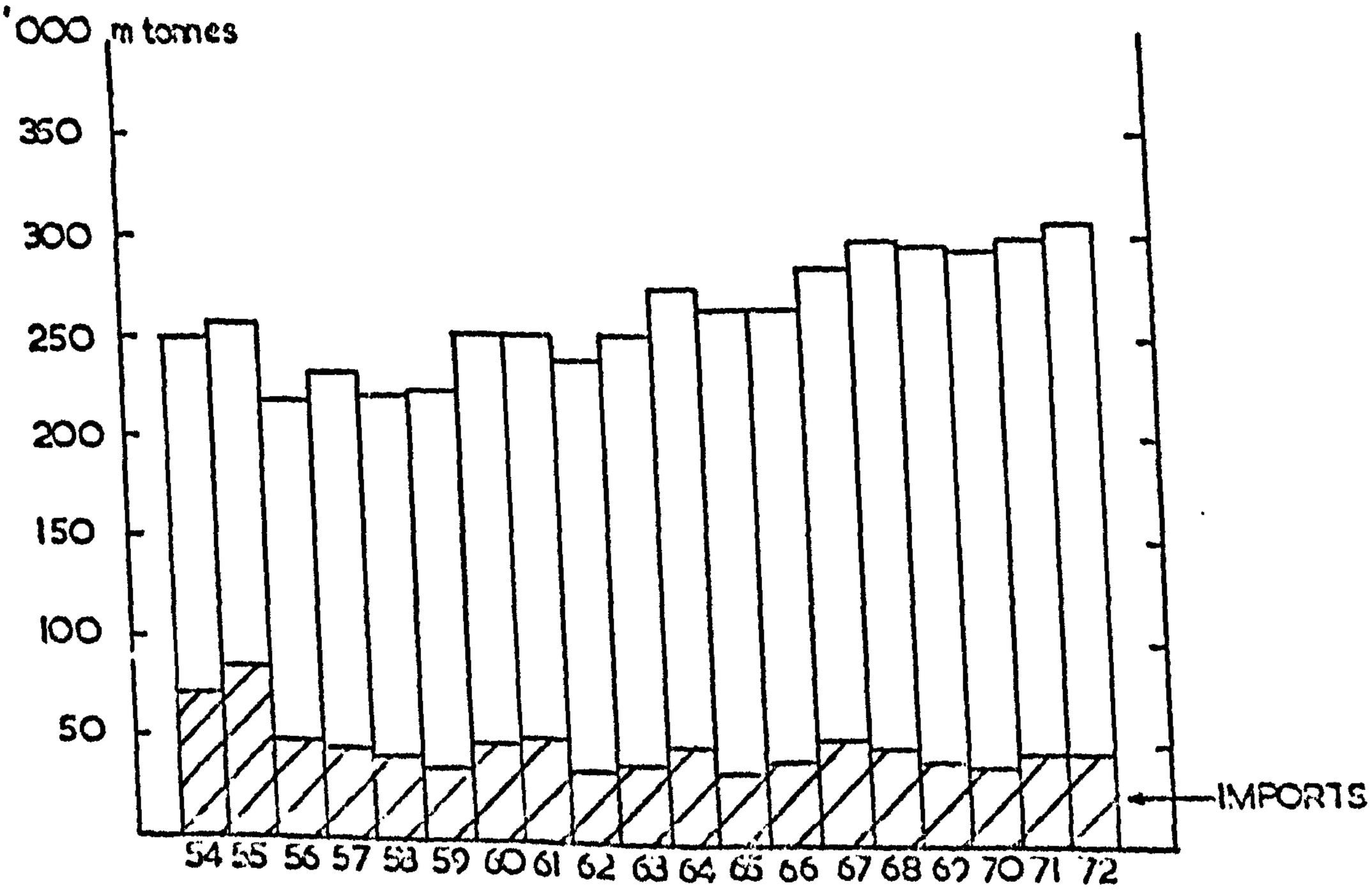


TABLE 28: FINANCIAL STATISTICS OF COMPANIES IDENTIFIED IN BOARD MANUFACTURING PRODUCT GROUP

£'000

YEAR	NUMBER OF COMPANIES	TOTAL TURNOVER	TOTAL EXPORTS	PRE-TAX PROFITS	TOTAL NET CASH FLOW	TOTAL EQUITY	TOTAL ANNUAL INVESTMENT
1968	20	76,274	3,776	4,191	5,852	41,396	6,302
1969	20	78,917	3,717	4,590	6,379	41,648	4,557
1970	20	79,620	3,674	3,809	5,754	40,096	5,726
1971	19	81,410	3,753	3,292	5,639	54,475	6,054
1972	20	89,051	5,097	5,068	7,296	57,573	4,739

Within the board manufacturing sector there has been a trend towards vertical integration over the past decade or so. In almost all cases this has been through mills buying up converting interests. Where mills have been bought up this has tended to be by larger conglomerates typically with strength in other industries. The three largest firms in the product group, Thames Board Mills, Wiggins Teape and Mardon Packaging are owned by diversified conglomerates, Unilever, British American Tobacco and Imperial Tobacco respectively.

Most producers of board confine their manufacturing activities to this product (different machines are required for paper and board manufacture) but one mill may produce a wide range of qualities of board. Board is sold almost entirely to industrial buyers. Many manufacturers sell a substantial proportion of their output to regular customers. Board is made entirely to order and not for stock, each batch being made to the customer's specifications. This results in a fairly competitive industry with a tendency for the larger firms to be price leaders. Whereas paper manufacturers distribute much of their output via merchants, competition among board manufacturers expresses itself through the use of salesmen for direct selling to customers.

Not all board manufacturers are in competition with one another. Within this sector there are distinct product sub-groups: coated and uncoated boards, base board for fibreboard packing cases, folding box grades, roofing felt base. In other words, manufacturers have specialised to fit in with segmentation within the converting industries. The lower penetration of imports indicates that board manufacturers experience less competition from overseas than other paper- making/converting companies. This reflects the bulky nature of the product and also the methods of selling and distribution (direct contact with customers and "tailor-made" production); competition has recently been increasing, especially from Scandinavia. The Scandinavians are achieving this by concentration on standard ranges of board; certain British customers are finding it more economical to purchase from these standard ranges than to order board which more precisely fits their particular requirements.

The principal raw material used for board production is wastepaper, and the industry is less vulnerable to changes in the supply and prices of pulp.

One major need is the establishment of an effective and reliable supply of wastepaper. Fluctuations in mill requirements have hindered the growth of regular collection. Because it is based on an indigenous raw material and because only a proportion of the potential amount of wastepaper is presently collected, the manufacture of board is regarded by the trade association as the sector of the paper industry most likely to withstand foreign competition.

Structure

Within the product group there has been a long-term tendency towards the takeover of smaller by larger firms. The present decline in liquidity and low profitability suggests that this will continue to be the pattern.

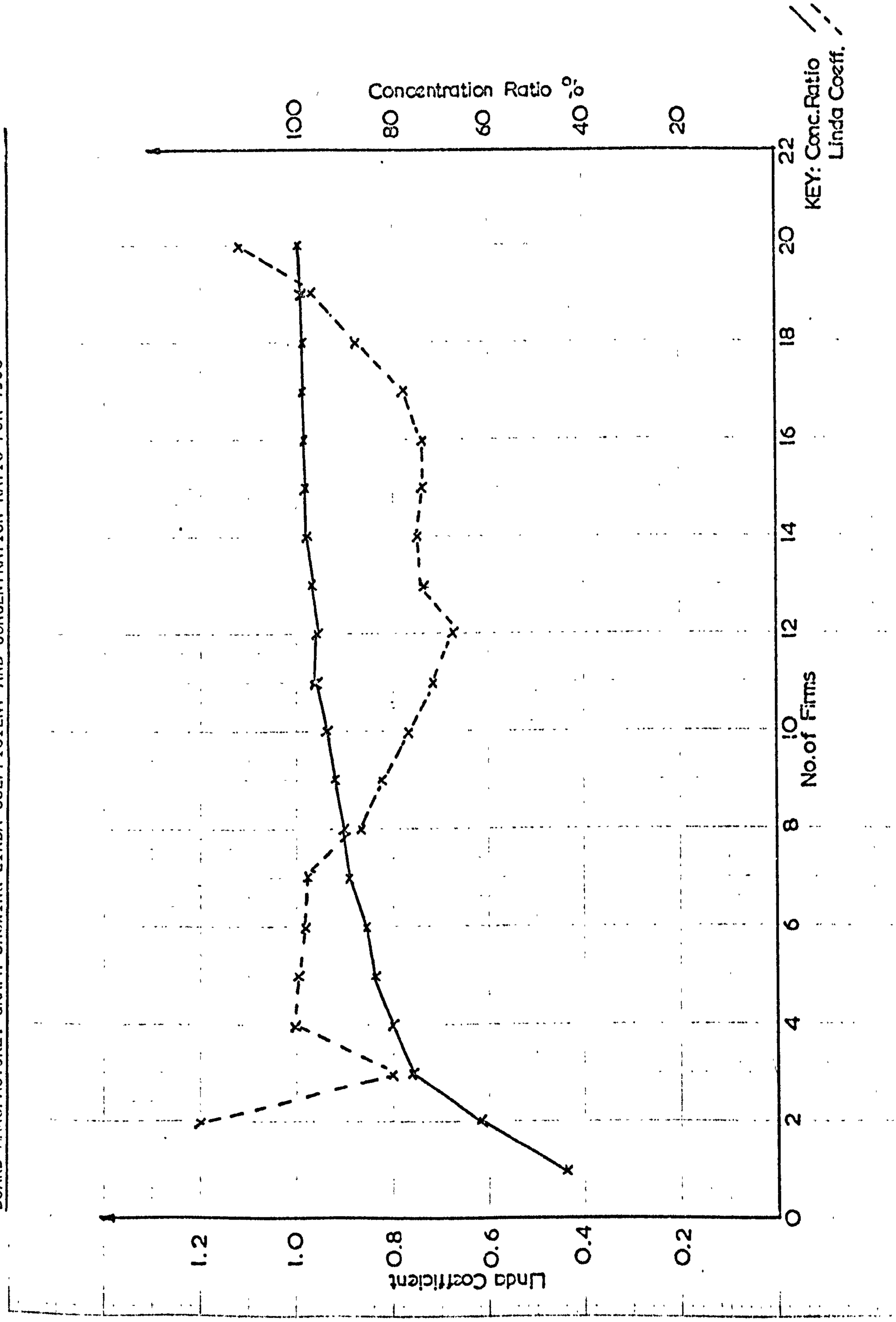
The effect of this long-run trend in the period analysed, 1968-1972 inclusive, Table 30, has been to decrease the variability in the sizes of the firms in the sector. This is reflected in the Gini coefficient and Herfindahl index which indicate a fall in concentration as the firms become more equal in size. The analysis of concentration ratios suggests that it is the largest 10-12 firms which are tending to become less dispersed in size. This is also clearly shown by the pronounced fall in the Linda indices for the 15 largest companies.

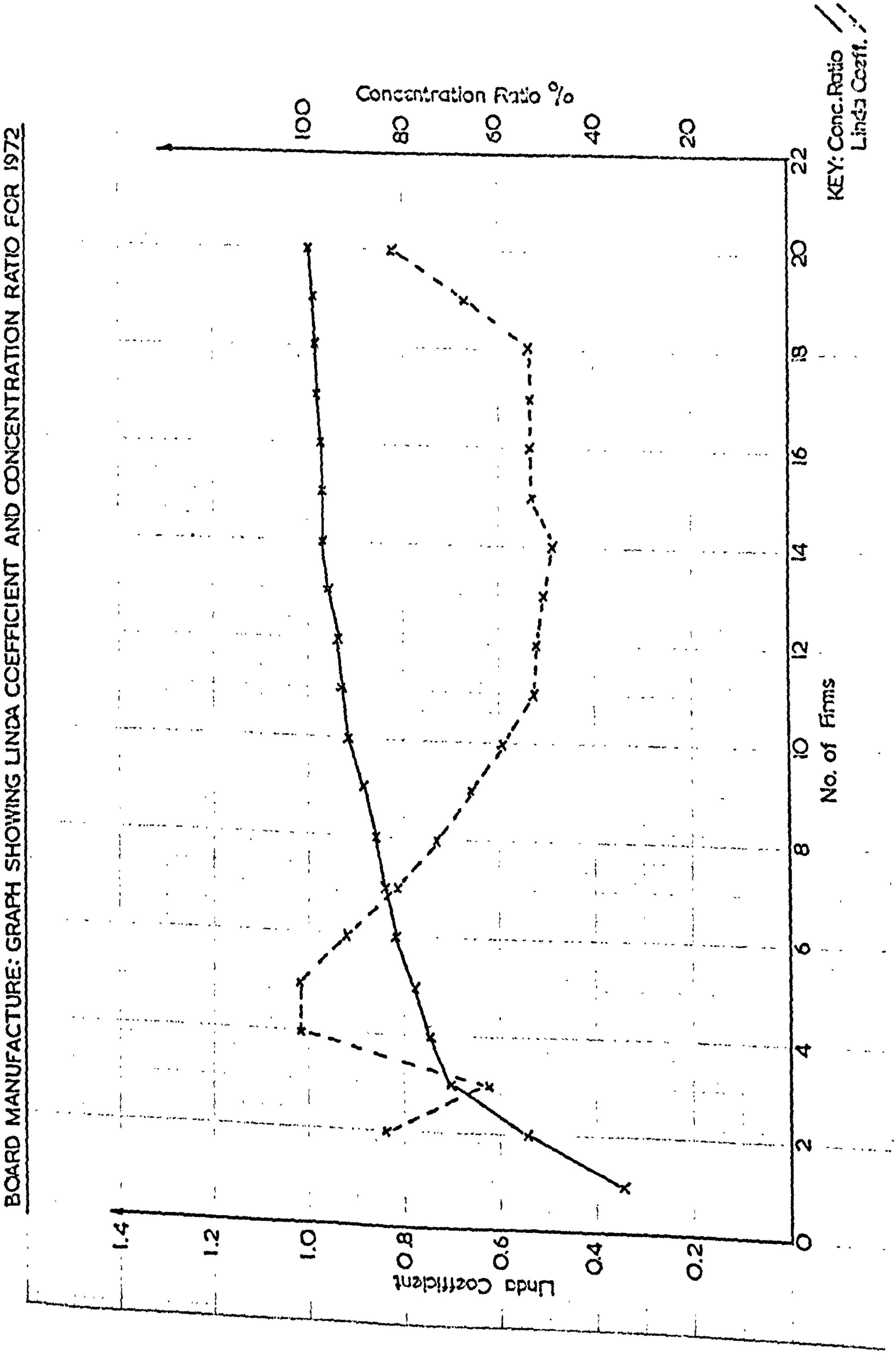
Diagrammatic representation of the concentration ratios and Linda indices shows a distinct "oligopolistic arena" consisting of the three largest firms. Their shares of total UK sales in 1972 were 35%, 23% and 13% respectively; the fourth largest firm accounted for only 4%.

TABLE 30: BOARD MANUFACTURE, ANALYSIS OF TURNOVER

	1968	1969	1970	1971	1972
No. of Companies	20	20	20	19	20
Total Turnover ('000)	76,274	78,917	79,620	81,410	89,051
Mean	3813.70	3945.85	3981.00	4284.73	4452.55
Coefficient of Variation	1.99	1.88	1.79	1.69	1.72
Gini	0.731	0.712	0.701	0.674	0.674
Herfindahl-Hirschmann	249.291	226.873	211.750	203.831	198.336
Entropy	- 82.126	- 85.430	- 87.277	- 88.640	- 90.200
Linda Index for N* / Concentration Ratios %					
= 2	1.24 / 61.3	1.10 / 58.9	0.97 / 56.9	0.95 / 55.8	0.84 / 56.0
= 5	1.02 / 83.5	0.99 / 81.3	0.98 / 80.1	0.95 / 78.9	1.01 / 78.3
= 10	0.76 / 93.9	0.64 / 93.6	0.58 / 93.6	0.57 / 92.5	0.59 / 91.0
= 15	0.74 / 98.6	0.66 / 98.6	0.63 / 98.5	0.57 / 98.6	0.53 / 97.9
= 19	0.98 / 99.9	0.91 / 99.8	0.84 / 99.8	0.90 / 100.0	0.67 / 99.8

BOARD MANUFACTURE: GRAPH SHOWING LINDA COEFFICIENT AND CONCENTRATION RATIO FOR 1968




BOARD MANUFACTURE: GRAPH SHOWING LINDA COEFFICIENT AND CONCENTRATION RATIO FOR 1972
Concentration Ratio %
100
80
60
40
20
KEY: Conc.Ratio
Linda Coeff.
Linda Coefficient
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
No. of Firms
2
4
6
8
10
12
14
16
18
20
22

SECTION 4. ANALYSIS OF CONVERTING PRODUCT GROUPS

1. Manufactured Stationery product group
2. Non-board packaging product group
3. Board packaging product group
4. Miscellaneous converted products group
5. Wallcoverings product group

SECTION 4

ANALYSIS OF CONVERTING PRODUCT GROUPS

Firms comprising the converting sector of the paper and board industry (NICE 272) were considered to fall into five distinct non-competing product groups:

stationery;
packaging - not board (paper bags, sacks);
board packaging (boxes, cartons, fibreboard cases);
miscellaneous (fancy goods, cups, plates);
wallcoverings.

The allocation of the individual firms into relevant product groups was undertaken as described in the case of manufacturing product groups (Section 3).

The analysis of the wallcovering product group is considered separately from general analysis of the converting product groups. The reasons for this are explained in Section 4.5.

TABLE 31: NUMBERS OF COMPANIES CLASSIFIED TO EACH PRODUCT GROUP

Year	Stationery	Packaging - not Board	Board Packaging	Misc.
1968	14	27	108	21
1969	14	27	107	21
1970	14	27	105	21
1971	14	27	102	21
1972	14	27	102	21

The analysis of seller concentration in each of the separate product groups was undertaken as described in the previous section relating to the manufacturing product groups analysis.

The concentration indices calculated for the four product groups, stationery, board packaging, non-board packaging and miscellaneous, are summarised in Tables 32 and 33.

The following sub-sections 4.1, 4.2, 4.3, and 4.4. consider in greater detail the economic features and performance of each product group. This introductory section is intended to present some preliminary conclusions relating to all of the converting product groups.

The various product groups identified within the converting sector of the UK paper industry represent very distinct and non-competing product markets. Although largely dependent on the manufacturing sector of the industry for its raw materials, the converting sector is concerned with the transformation of the paper and board into its final useable form.

A clear distinction can be made between board and non-board packaging. Although both may be considered as alternative forms of packaging, the products of the two groups exhibit physical properties which tend to make them non-competitive: board packaging usually represents the outer form of packaging, boxes, cartons and the stronger fibreboard packing cases. Non-board packaging includes paper bags, carrier bags and other paper wrappings. Such products experience more competition from plastic, polythene and cellulose packing than from board packaging.

Miscellaneous converted products include other packaging items such as tapes, gummed tape, labels, etc., as well as a plethora of items such as novelties, crackers, dress patterns and cigarette filters.

Stationery forms a further distinct product group involving the conversion of fine papers into their final product form: envelopes, school and office stationery, and so on.

With such a diverse range of product markets within the converting sector of the industry, the economic structure and performance of any product group will not necessarily bear any resemblance to any other product group. - The very wide difference in the number of companies in each product group is an indication of this fact.

TABLE 32: ANALYSIS OF TURNOVER OF DIFFERENT CONVERTING PRODUCT GROUPS

COEFFICIENT OF VARIATION

Product Group	1968	1969	1970	1971	1972
Stationery	2.22	2.28	2.25	2.26	2.20
Packaging - Not Board	2.01	2.12	2.08	2.04	2.02
Miscellaneous	1.71	1.71	1.73	1.79	1.79
Board Packaging	3.27	3.20	2.97	2.98	2.95

GINI COEFFICIENT

Product Group	1968	1969	1970	1971	1972
Stationery	0.82	0.81	0.81	0.81	0.81
Packaging -Not Board	0.66	0.67	0.67	0.66	0.67
Miscellaneous	0.68	0.68	0.69	0.69	0.68
Board Packaging	0.83	0.83	0.82	0.82	0.82

HERFINDAHL-HIRSCHMANN INDEX

Product Group	1968	1969	1970	1971	1972
Stationery	423.5	444.3	432.0	437.9	416.8
Packaging - Not Board	187.0	203.1	196.8	190.6	187.8
Miscellaneous	187.1	186.4	190.9	200.3	200.1
Board Packaging	108.4	104.1	93.6	96.9	95.0

ENTROPY INDEX

Product Group	1968	1969	1970	1971	1972
Stationery	-51.05	-51.89	-53.88	-53.59	-52.46
Packaging - Not Board	-100.89	-98.64	-99.57	-101.25	-100.54
Miscellaneous	-93.31	-93.19	-92.44	-91.42	-91.86
Board Packaging	-128.42	-129.19	-131.95	-131.12	-131.11

TABLE 33: ANALYSIS OF TURNOVER OF THE CONVERTING PRODUCT GROUPS

Year	1968	1969	1970	1971	1972
	CONCENTRATION RATIO AT N* = 5 / LINDA INDEX AT N* = 5				
Stationery	96.7 / 2.30	97.5 / 2.25	95.7 / 1.94	95.6 / 1.74	95.5 / 1.77
Packaging - Not Board	69.5 / 1.10	70.1 / 1.19	69.5 / 1.18	67.8 / 1.12	68.7 / 1.07
Miscellaneous	76.7 / 0.73	76.8 / 0.71	78.4 / 0.72	77.9 / 0.82	77.4 / 0.87
Board Packaging	63.0 / 0.60	61.6 / 0.59	59.6 / 0.49	60.8 / 0.49	60.0 / 0.50

Year	1968	1969	1970	1971	1972
	CONCENTRATION RATIO AT N* = 10 / LINDA INDEX AT N* = 10				
Stationery	99.5 / 2.94	99.6 / 4.15	99.5 / 2.64	99.4 / 2.64	99.4 / 2.63
Packaging - Not Board	82.7 / 0.58	83.2 / 0.60	83.3 / 0.58	82.7 / 0.53	84.3 / 0.52
Miscellaneous	91.9 / 0.50	92.5 / 0.49	92.2 / 0.56	92.0 / 0.56	91.2 / 0.57
Board Packaging	77.5 / 0.41	76.9 / 0.38	74.4 / 0.37	75.3 / 0.38	74.9 / 0.38

Board Packaging is the largest product group in the converting sector having over three times as many firms as in the next largest product group - Non-Board Packaging. On the other hand, stationery manufacture has relatively few firms.

The relative numbers of firms in each product group is reflected in both the Herfindahl-Hirschmann and Entropy indices: both show similar values respectively for non-board packaging and miscellaneous manufacturers, these product groups having roughly similar numbers of firms, and exhibit extreme values for the two product groups with very large and very small numbers of firms.

Having the largest number of companies, the board packaging product group shows the greatest degree of variability between sizes of firms as measured by the coefficient of variation. The stationery product group has the second highest coefficient of variation. The reason for this is that this group is dominated by a single particularly large manufacturer. This fact is further reflected in the relative values of the concentration ratio for the top 5 firms, where the stationery product group appears most concentrated. Graphs showing the full series of concentration ratios and Linda indices can be found in the relevant sub-sections.

The Analysis of Performance

In Section 2, the performance of the UK paper and board industry was analysed in terms of the level of employment in each sector between 1968-1972. It was stated then that the more conventional performance measures of profit margin and return on equity could not be calculated for large sectors of an industry containing many companies not competing in similar product markets. At this stage of examining those individual product markets, performance can be more meaningfully analysed in terms of profitability and return on equity.

Tables 34 and 35 below show the mean and standard deviation of respectively profit margin and return on equity for each of the product groups identified. The ratios used were as follows:

$$\text{profit margin} = \frac{\text{profit before tax}}{\text{turnover}}$$

$$\text{return on equity} = \frac{\text{profit before tax}}{\text{shares + reserves}}$$

(Throughout the analysis, companies making losses in any year are included and the value of the loss computed as a negative profit. This allows a more satisfactory analysis of the variability in performance.)

Tables 34 and 35 show a wide variation in the value of both the profit margin and return on equity, both from product group to product group; and from year to year for any given product group. As already pointed out, the diverse range of product markets within the converting sector partly explains the differences in the performance of each grouping.

As with the manufacturing product groups, it was decided to investigate how much of the dispersion of profitability was explained by differences between individual forms which occurred consistently in each of the five years. The methods used are explained on page 3.7 above and the results shown in the following tables.

Coefficients of variation (Standard deviation/Arithmetic mean)

(a) of five-year averages for individual firms;
(b) of all the individual figures for each of the five years.

PROFIT MARGIN ON TURNOVER

	(a)	(b)
Stationery	0.56	0.70
Packaging - not board	0.78	0.92
Miscellaneous	1.28	1.59
Board packaging		1.26

RETURN ON EQUITY

Stationery	1.03	2.63
Packaging - not board	1.91	2.16
Miscellaneous	3.10	3.55
Board packaging	1.68	3.25

TABLE 34: ANALYSIS OF PROFIT MARGIN

Mean profit margin / Standard deviation of profit margin	1968	1969	1970	1971	1972
Stationery	0.045 / 0.061	0.064 / 0.068	0.005 / 0.168	0.006 / 0.113	0.032 / 0.081
Packaging - Not Board	0.064 / 0.047	0.054 / 0.055	0.047 / 0.059	0.048 / 0.050	0.063 / 0.040
Miscellaneous	0.064 / 0.101	0.064 / 0.093	0.056 / 0.096	0.059 / 0.090	0.065 / 0.108
Board Packaging	0.060 / 0.063	0.063 / 0.093	0.048 / 0.085	0.060 / 0.054	0.062 / 0.063

TABLE 35: ANALYSIS OF RETURN ON EQUITY

Stationery	0.132 / 0.151	0.376 / 0.986	0.365 / 0.662	0.029 / 0.642	0.295 / 0.388
Packaging - Not Board	0.393 / 0.951	0.354 / 1.035	0.260 / 0.348	0.283 / 0.462	0.402 / 0.598
Miscellaneous	0.788 / 2.719	0.697 / 2.086	1.035 / 3.802	0.638 / 1.995	0.325 / 0.591
Board Packaging	0.398 / 1.582	0.263 / 0.735	0.378 / 1.426	0.277 / 0.358	0.284 / 0.326

This analysis shows that, as in the manufacturing sectors, most of the variation in rates of profits is due to differences between firms which were consistent over the five-year period. As was pointed out on page 3.7 inconsistencies in the original data and assumptions adopted for the purposes of this report may account for part of these differences. Before definitive conclusions could be drawn from this analysis, more exhaustive research would be required.

No relationship was found to exist between profitability and size. To some extent, this may reflect deficiencies in the basic data, but the absence of any such relationship is consistent with conclusions drawn from the analysis of product groups in the following sections. The results are shown in the following table.

REGRESSION ANALYSIS - VALUE OF R^2 COEFFICIENT

Product Group	$\frac{\text{Profit Margin}}{\text{Turnover}}$	$\frac{\text{Return on Equity}}{\text{Equity}}$
Stationery	0.03386	0.00011
Non-board packaging	0.00025	0.00039
Miscellaneous	0.04112	0.01492
Board Packaging	0.00222	0.00268

SECTION 4 SUB-SECTION 1

STATIONERY PRODUCT GROUP

Classified to this product group are those firms engaged in the manufacture of stationery including writing pads, envelopes, manuscript books, account books, office and school stationery, cardboard files, index cards and tabulating machine cards.

The market for stationery is seen to fall into three segments:

(i) the domestic market, catering for the individual who requires writing paper and envelopes, notepaper and exercise books;

(ii) industry generally which requires supplies of plain envelopes, pay packets, account books, index cards and so on;

(iii) "big industry" which requires printed and personalised stationery of all types in large quantities.

Stationery orders will be met from stock or will be made to order according to which of the above three markets the manufacturer is supplying: the larger buyers, requiring personalised stationery, will place bulk orders directly with the manufacturers: more standardised products will, on the other hand, be met from stock. Stock distribution is primarily through wholesalers or direct to retail stationers.

The product group is dominated by one manufacturer, John Dickinson, which is a subsidiary of one of the major groups in the industry, having other subsidiaries in both the manufacturing and converting sectors. This dominance of the product group is illustrated in the attached graphs of concentration ratios and Linda indices. It will be noticed that the minimum value of the Linda occurs at $n^* = 2$, and rises thereafter, suggesting the existence of a single oligopolist. The other large stationery manufacturers are Wiggins Teape and Spicers - which is part of Reed International.

The asset structure of the firms identified in the product group is shown in Table 36 below and statistics of other financial variables relating to the firms in the product group are shown in Table 37.

TABLE 36: ASSET STRUCTURE OF FIRMS IDENTIFIED IN STATIONERY PRODUCT GROUP

Own Capital (£'000)	No. of firms 1968	No. of firms 1972
0 - 50	2	2
51 - 500	6	7
501 - 1,000	0	1
1,001 - 10,000	4	2
10,001 - 20,000	1	1
20,001 - 50,000	1	1
	14	14

The analysis of concentration within the product group is shown in Table 38 It has already been mentioned that the group is dominated by a single manufacturer and has the fewest members of all converting product groups. These facts are reflected in the various concentration indices. During the period under examination, 1968-1972, the values of the various concentration indices have remained fairly static.

TABLE 37: FINANCIAL STATISTICS OF COMPANIES IDENTIFIED IN STATIONERY PRODUCT GROUP

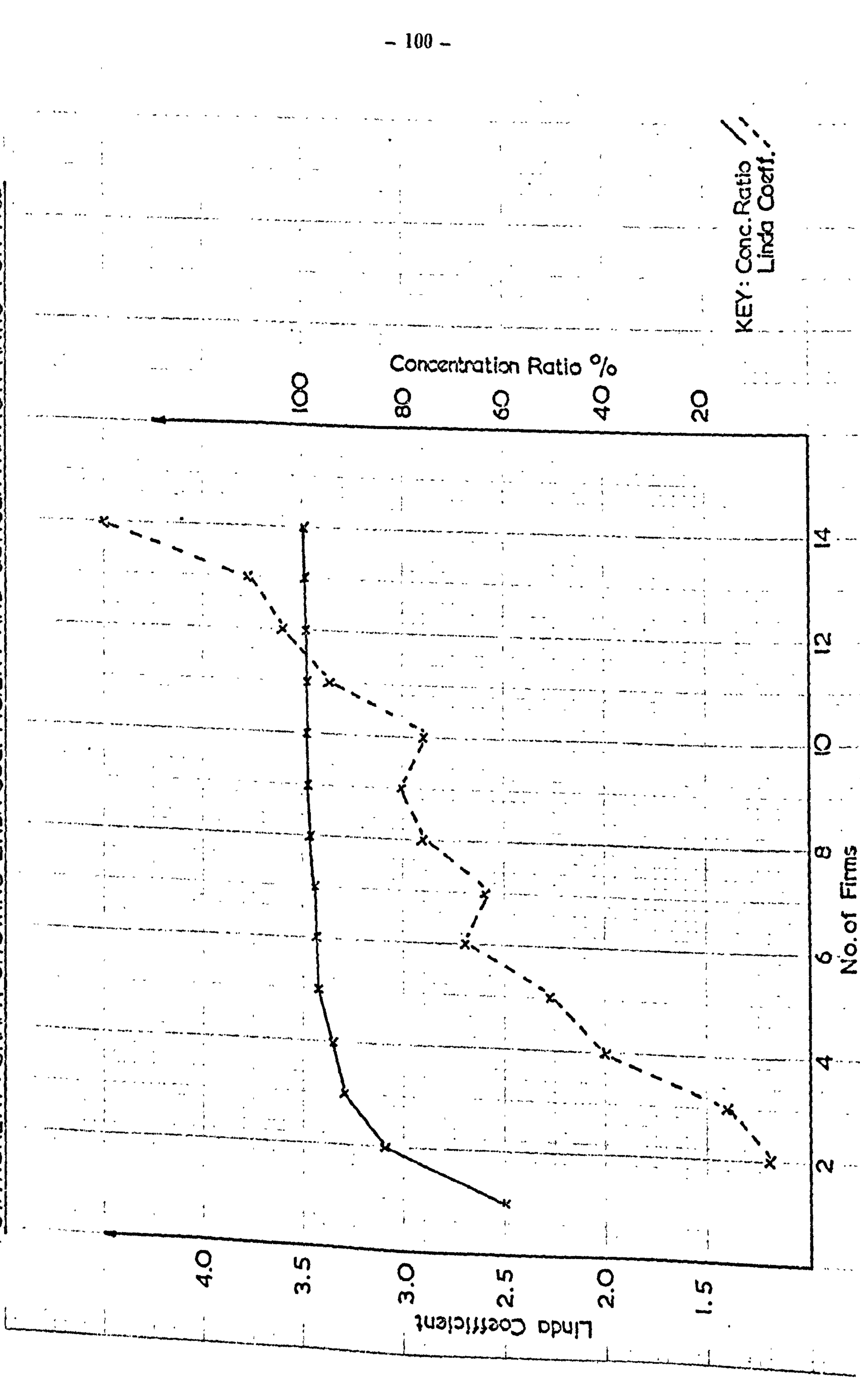
£'000

YEAR	NUMBER OF COMPANIES	TOTAL TURNOVER	TOTAL EXPORTS	PRE-TAX PROFITS	TOTAL NET CASH FLOW	TOTAL EQUITY	TOTAL ANNUAL INVESTMENT
1968	14	153,074	8,228	11,149	9,754	46,362	4,479
1969	14	166,990	9,610	12,553	11,281	44,954	5,651
1970	14	178,239	11,373	12,048	11,545	48,262	6,436
1971	14	189;179	15,025	9,551	10,321	46,472	9,850
1972	14	207,905	14,604	11,807	10,645	57,791	7,589

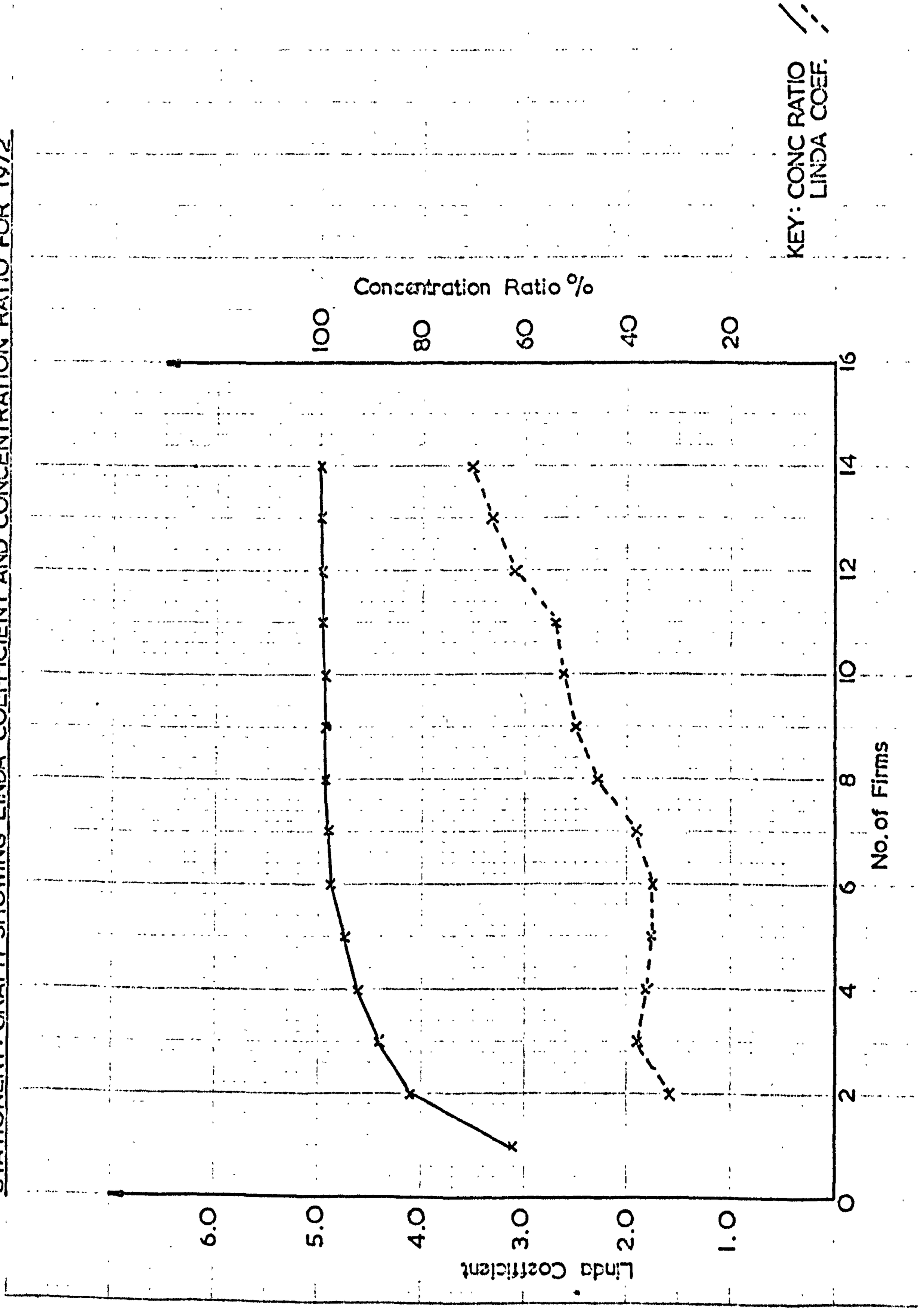
TABLE 38: STATIONERY, ANALYSIS OF TURNOVER

	1968	1969	1970	1971	1972
No. of Companies	14	14	14	14	14
Total Turnover ('000)	153,074	166,990	178,239	189,179	207,905
Mean	10933.857	11927.857	12731.357	13512.786	14850.357
Coefficient of Variation	2.198	2.220	2.284	2.246	2.264
Gini	0.813	0.821	0.812	0.805	0.805
Herfindahl-Hirschmann	416.776	423.483	444.264	431.984	437.856
Entropy	- 52.463	- 51.048	- 51.894	- 53.881	- 52.463
Linda Index for N* / Concentration Ratios %					
= 2	1.17 / 83.7	1.19 / 84.1	1.37 / 84.9	1.49 / 82.5	1.55 / 82.6
= 5	2.29 / 96.7	2.24 / 97.5	1.93 / 95.7	1.73 / 95.6	1.77 / 95.4
= 10	2.93 / 99.5	4.15 / 99.5	2.64 / 99.4	2.63 / 99.4	2.62 / 99.3
= 14	5.05 / 100.0	5.69 / 100.0	3.97 / 100.0	3.40 / 100.0	3.53 / 100.0

STATIONERY: GRAPH SHOWING LINDA COEFFICIENT AND CONCENTRATION RATIO FOR 1963



STATIONERY: GRAPH SHOWING LINDA COEFFICIENT AND CONCENTRATION RATIO FOR 1972



SECTION 4: SUB-SECTION 2

NON-BOARD PACKAGING PRODUCT GROUP

Classified as producers of non-board packaging are manufacturers of paper bags, including print bags, multi-wall paper sacks and other packaging items such as moulded pulp units, jam pot covers and bottle caps.

In terms of turnover, non-board packaging represents only approximately one quarter of all paper and board packaging. Non-board packaging items, such as paper bags and sacks, probably represent the product group with the highest cross-elasticity in respect of competing goods made from materials other than paper. Plastic and cellulose bags and sacks have, to an extent, replaced paper equivalents, these former having the advantage of greater strength and waterproofness. For this reason, the entire market for all types of bags and sacks should ideally be considered before conclusions as to firms' conduct and behaviour can be made. Paper bag manufacturers have met this competition by themselves producing bags of materials other than paper.

Paper bags require a great variety of papers for their manufacture, depending on the end use. Raw materials are bought from British or Scandinavian paper mills, and bags are made from the reel. Buying is primarily on the basis of price and quality: integrated companies do not necessarily buy from the parent company's manufacturing mill, but will go for the best price. It is however advantageous at times of shortage to have assured supplies of raw materials.

Apart from the larger bag manufacturers identified, the product group is characterised by an estimated 100 very small operators for whom data was not available. Most smaller manufacturers tend to be single-product orientated whereas the larger firms have diversified into other forms of packaging. There are an estimated six integrated manufacturers, the remainder being entirely bag manufacturers.

Given that a firm is a bag manufacturer, there is little sub-specialisation. A manufacturer can produce a wide range and variety of paper bags; only carrier bags require special plant. This results in a highly competitive atmosphere within the industry.

Specialisation within the industry is confined to whether or not the manufacturer undertakes the printing of bags. Non-printed bags are produced in large quantities and are generally distributed through merchants. Paper and other wrapping bags are such "regular use" items that total usage is not expected to increase significantly; if anything, the use of paper bags may decline as retailers try to cust costs and housewives attempt to conserve resources!

"Own name" bags and carriers are produced to the buyer's specification. Customers requiring such wrappings vary from the large retail chains down to the local grocer. In such a situation, larger buyers have a monopsonistic position.

For comparison, the following table illustrates the relative importance of the different packaging types:

TABLE 39: MANUFACTURERS' SALES OF PACKAGING PRODUCTS (£m)

	1971	1972	1973
Paper and Board	n/a	640	767
Plastic	111	128	231
Laminates (foil on plastic, paper cellulose, polythene, etc.)	n/a	27	48
Metal	n/a	n/a	327
Wood, etc.	44	43	56
Glass	100	110	123

Business Monitor PQ 480

Structure

The financial statistics relating to the firms identified in the product group are presented in Table 40.

The largest firms in the product group in the period investigated, 1968-1972, were subsidiaries of Dickinson Robinson and Reed International.

TABLE 40: FINANCIAL STATISTICS OF COMPANIES IDENTIFIED IN NON-BOARD PACKAGING PRODUCT GROUP

£'000

YEAR	NUMBER OF COMPANIES	TOTAL TURNOVER	TOTAL EXPORTS	PRE-TAX PROFITS	TOTAL NET CASH FLOW	TOTAL EQUITY	TOTAL ANNUAL INVESTMENT
1968	27	38,154	1,334	2,714	2,584	7,778	1,704
1969	27	42,602	1,495	2,377	2,160	7,616	2,331
1970	27	46,895	1,634	2,340	2,386	7,447	2,773
1971	27	46,674	1,510	1,819	2,072	7,721	1,510
1972	27	52,289	2,042	2,781	2,952	8,336	932

The importance of the two largest firms is reflected in concentration ratios which indicate that nearly 60% of the turnover of the product group is accounted for by the top two firms. The concentration ratios and Linda indices for the product group are shown graphically below.

Examination of the Linda and concentration indices shows that the two largest firms are considerably greater than their other competitors and in 1972 their sales accounted for 37% and 19% of sales by all British companies; the next largest firm accounted for only 5%. Although according to these indices these two firms, Dickinson Robinson and Reeds, form a duopoly, this position is modified by competition from products outside the definition of the industry.

An analysis of the asset structure of the firms classified to the product group is shown in Table 41. Relative to other product groups examined, the range of size of firms is not great, no firm having equity of greater than £10 million, with a distinct modal value of £51-500,000.

TABLE 41: ASSET STRUCTURE OF FIRMS IDENTIFIED IN THE NON-BOARD PACKAGING PRODUCT GROUP

Own Capital (£'000)	No. of firms 1968	No. of firms 1972
0 - 50	4	2
51 - 500	19	20
501 - 1,000	3	4
1,001 - 10,000	1	1
More than 10,000	0	0
	27	27

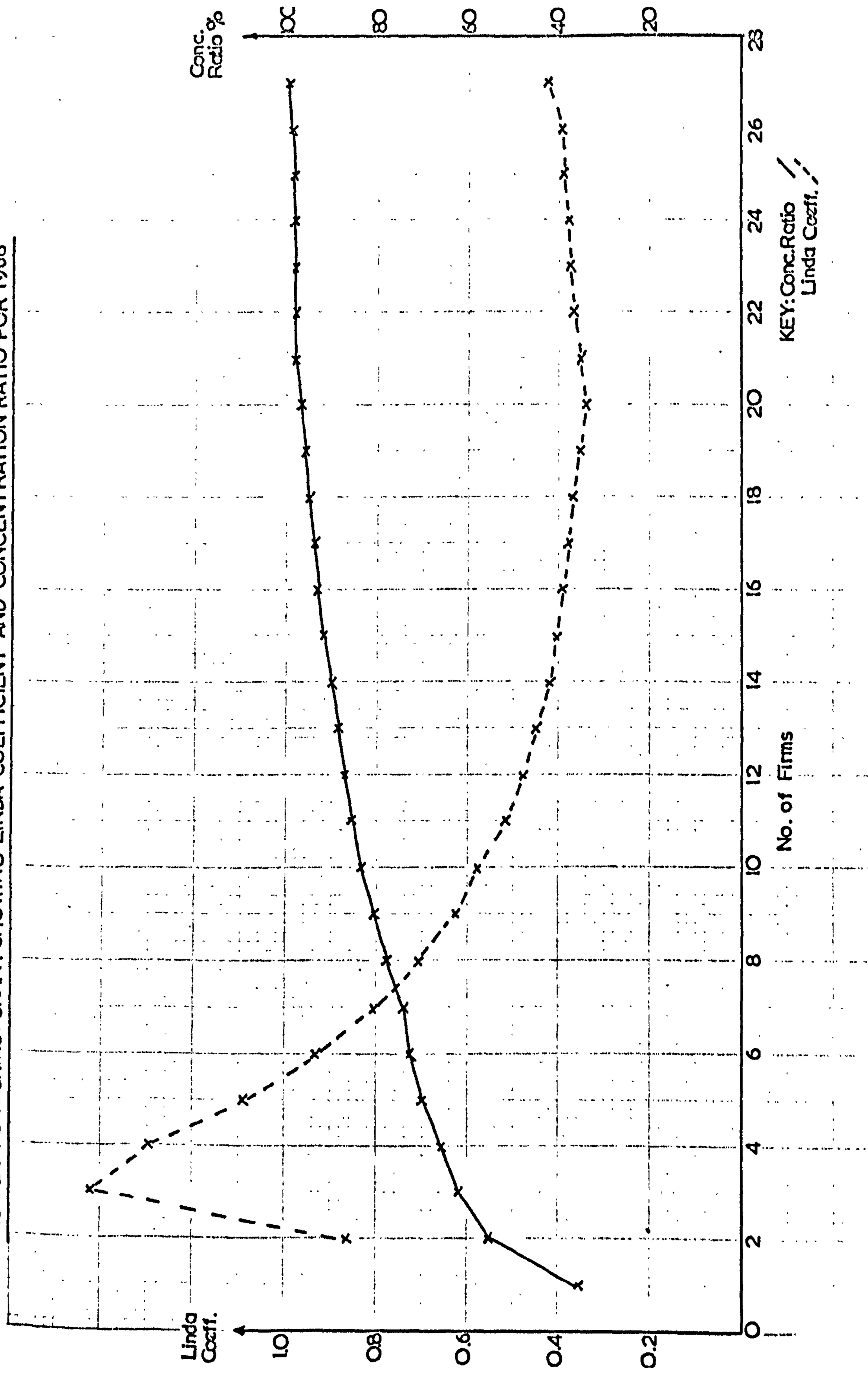
From 1968-1972 net cash flow fell in money terms implying a much greater fall in real terms of expenditure on investment.

Relative to other product groups examined in the conversion of paper and board industry, the manufacture of non-board packaging appears the least concentrated· a Gini coefficient of less than 0.7 reflects this fact. Table 42 shows the concentration indices for the product group.

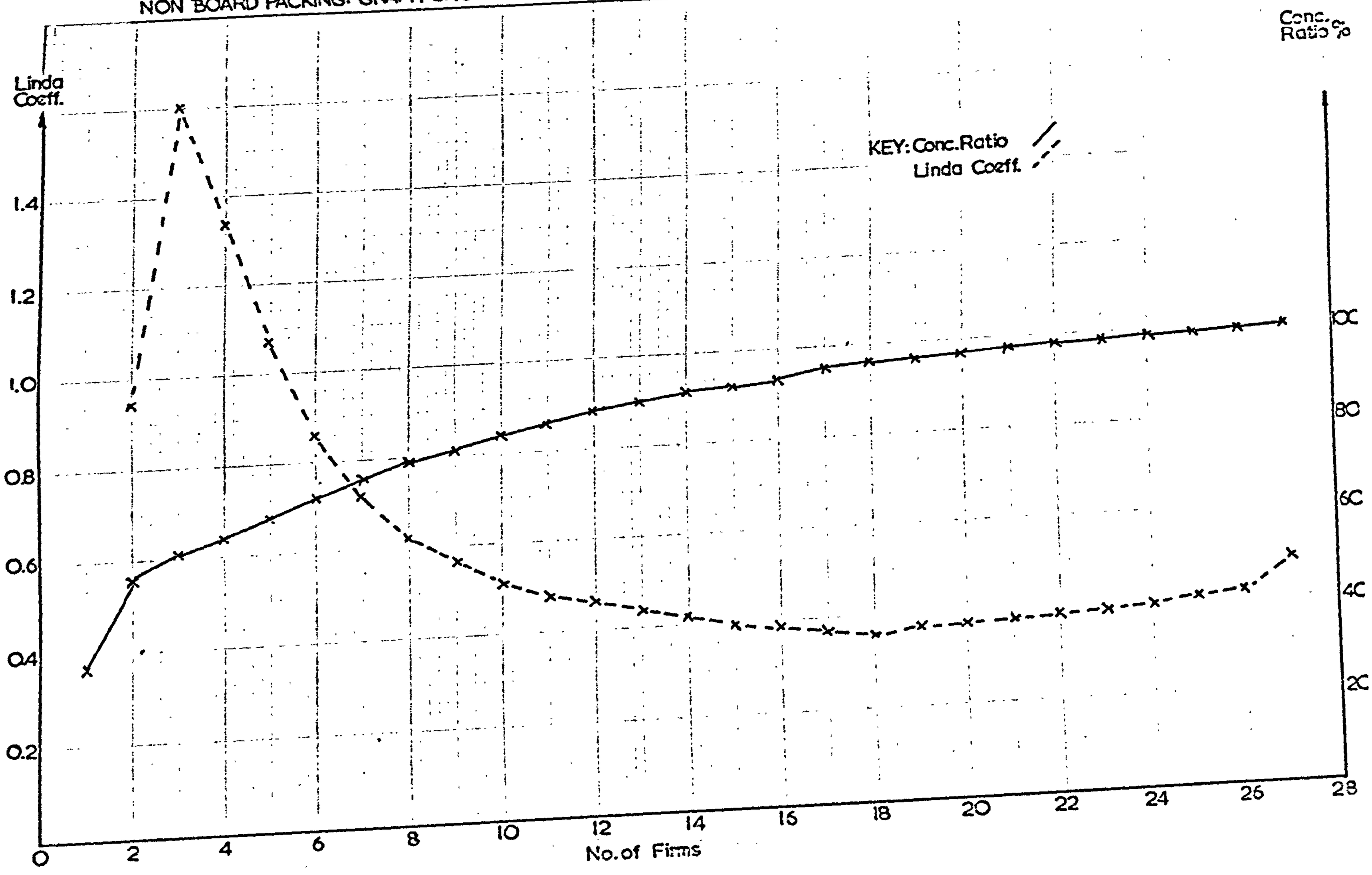
TABLE 42: PACKAGING (NOT INCL. BOARD), ANALYSIS OF TURNOVER

	1968	1969	1970	1971	1972
No. of Companies	27	27	27	27	27
Total Turnover ('000)	38,154	42,602	46,895	46,674	52,289
Mean	1413.111	1577.852	1736.852	1728.667	1936.630
Coefficient of Variation	2.012	2.117	2.077	2.036	2.017
Gini	0.661	0.670	0.667	0.656	0.669
Herfindahl-Hirschmann	187.017	203.106	196.816	190.594	187.755
Entropy	-100.889	- 98.640	- 99.568	-101.251	-100.535
Linda Index for N* / Concentration Ratios %					
= 2	0.86 / 57.2	1.00 / 58.9	0.96 / 58.1	1.05 / 56.4	0.94 / 56.6
= 5	1.09 / 69.4	1.19 / 70.0	1.18 / 69.5	1.12 / 67.8	1.06 / 68.6
= 10	0.57 / 82.7	0.60 / 83.2	0.57 / 83.2	0.53 / 82.7	0.51 / 84.2
= 15	0.39 / 91.9	0.42 / 91.8	0.41 / 91.9	0.39 / 91.7	0.39 / 92.6
= 20	0.34 / 97.3	0.35 / 97.5	0.36 / 97.3	0.35 / 97.1	0.37 / 97.4
= 27	0.42 / 100.0	0.45 / 100.0	0.44 / 100.0	0.43 / 100.0	0.49 / 100.0

FIG. 1: GRAPH SHOWING LINDA COEFFICIENT AND CONCENTRATION RATIO FOR NON BOARD PACKING IN 1968



NON BOARD PACKING: GRAPH SHOWING LINDA COEFFICIENT AND CONCENTRATION RATIO FOR 1972



Since 1968, the product group appears static in terms of concentration. As already explained, this is not a growth sector and the firms in the industry are long-established, this being one of the oldest converting sectors.

The highly competitive nature of the grouping has in the past caused exits from the industry, but more recently firms have continued to exist through increased specialisation. It is through such specialisation that large and small manufacturers can survive together.

Again the competitiveness of the product group and the existence of older firms with established market shares act against new entry into the industry. Similarly, takeovers have been limited, as paper bags manufacturing is not a profitable area of diversification.

This somewhat static picture is not expected to change within the near future.

SECTION 4: SUB-SECTION 3

BOARD PACKAGING PRODUCT GROUP

Folding Cartons

The Board Packaging product group can be considered in two distinct sections - the conversion of board into folding boxes and the manufacture of fibreboard packing cases. Very crudely, fibreboard packing cases represent the heavier, outer form of packaging, while folding boxes are used for the initial packing of goods.

Folding cartons are used widely to package food and non-consumable items. Plastic, cellophane, and paper/plastics mixtures are increasing in importance as packaging materials. Recognising this, many of the converters in this product group produce both paper (predominantly) and some plastic packaging items, in order to ensure the packaging buyer of the best type of packing for his particular product.

In order to produce folding boxes, converting organisations require board in many varieties. Board is obtained from both home and foreign mills. Those converters who are subsidiaries of vertically integrated groups having a board manufacturing subsidiary have guaranteed supplies of board for conversion.

Independent converting firms are in a less favourable position regarding the purchasing of manufactured board. To a certain extent they are forced to accept the selling terms of the larger board manufacturers, especially when board is in short supply.

Folding carton makers produce almost entirely to order. The nature of the product is such that it is "tailor-made" to the requirements of individual customers.

Considerable economies of scale can be obtained from long production runs. For this reason, several of the producers are reliant on a small number of regular customers. Again, the market strength of the large buyer is felt by the smaller folding carton makers: such large buyers will perhaps split an order between several small producers. This small producer cannot withhold supplies to the buyer (for instance to speed up payment) as the buyer will not miss the quantity and the producer is left with useless

"tailor-made" cartons.

Even so, the smaller firms do exist alongside the larger ones. This fact is attributable to the willingness and ability of the smaller firms to produce specialised products and to undertake small runs for individual customers.

Fibreboard Containers

Production of fibreboard cases can be further subdivided into the production of solid cases and the production of corrugated cases. Originally fibreboard containers were of the solid type, but their use has of more recent years been superseded by the use of corrugated cases, as the tables below indicate.

Year	64	65	66	67	68	69	70	71	72	73
Solid	246	241	277	222	233	222	196	173	155	161
Corrugated	842	865	929	949	1075	1146	1192	1201	1277	1399
TOTAL	1088	1106	1206	1171	1308	1368	1388	1374	1432	1560

The relative growth in the two sub-sectors is further reflected by the relative levels of capital formation over the last 10 years.

Year	65	66	67	68	69	70	71	72	73
SOLID:									
Plants with laminators	10	10	10	10	9	8	9	9	9
Number of laminators	15	15	15	15	14	13	13	13	13
CORRUGATED:									
Plants with corrugators	52	52	55	57	59	64	66	70	70
Number of corrugators	75	75	76	76	80	87	89	94	98

The Fibreboard Packing Case Association

Fibreboard cases are used for the outer packaging of goods. The properties users seek in packing their goods in fibreboard containers are strength to protect valuable goods in transit as well as moisture resistance. Prior to the widespread use of fibreboard cases, approximately 10 years ago, wooden boxes were used for outer packaging. Now fibreboard case manufacturers see their main competition from plastic containers. Fibreboard cases are used throughout all industrial sectors as the following end use classification indicates.

TABLE 43: END USE CLASSIFICATION - FIBREBOARD CONTAINERS - 1972

	%
Foodstuffs	28.8
Metal working, machines and parts, electrical machines (excl. household appliances)	13.5
Radio, TV., communication equipment, household appliances	11.7
Beverages	9.9
Agricultural produce and fresh foods	9.6
Soaps, perfumes, cosmetics, etc.	5.2
Ceramics, glassware, other non-metallic products	3.7
Chemical and allied products	3.5
Paper goods and printed matter	3.3
Other	10.8
	100.0%

British Fibreboard Packing Case Association

The manufacture of fibreboard cases is in two stages: the manufacture of the solid or corrugated case material, and the conversion of this material into actual cases. Obviously some firms within the industry are engaged in both processes. Other producers buy in the completed board and are concerned with the conversion process only. New entrants into the industry tend to be via the conversion process because of the initially high capital costs involved in putting down a corrugating or laminating plant.

Inputs into the manufacturing process are kraft liner in sheet form, and fluting material, usually the cheapest quality available including waste. Kraft liner has to be imported (see Manufacturing section). Obviously in times of excess demand, those manufacturers with overseas links will have priority in receiving kraft liner. As material costs are over 50% of the cost of production, individual manufacturers are vulnerable to increased costs of imports; but prices from suppliers tend to be similar.

Individual firms within the fibreboard case-making sector are generally single product firms. The particularly large firms who are part of diversified conglomerates are now beginning to move into the new plastics product market.

Manufacturers do not produce fibreboard cases for stock - every order placed with a producer is a tailor-made job. The practice of producing for stock is discouraged unless the manufacturer is totally confident of a repeat order. This reflects the normally very competitive nature of the industry - this pattern having been somewhat distorted in the present situation of short supply of paper goods generally. Manufacturers are tied to particular buyers only to the extent of inter-group trading. Competition reflects itself in the marketing strategies which are to a limited extent through industrial advertising, but largely through direct-selling salesmen.

Why does the industry appear so competitive despite a fairly high degree of concentration? Small "converting only" firms specialise in small runs and specialty products. The larger firms are more concerned with bulk orders involving long production runs to reduce costs.

Structure

The large firms in this section of the converting industry during the period 1968-1972 were Reeds, Bowaters, Mardon Packaging, Unilever, McMillan Bloedal, Tremletts and Tillotsons Corrugated Cases.

The product group is characterised by a large dispersion in the sizes of firms in the industry. Although over 100 firms have been identified in the sector, the top two account for 35% of turnover, and 75% of total turnover is controlled by the top 10. Similarly, at the lower end of the distribution, the bottom 50 or so firms appear very small in terms of turnover. This pattern is not incompatible with the nature of the product allowing the small specialists to exist alongside the "giants". The asset structure of the product group is shown in Table 44 below.

During the period examined, 1968-1972, there have been no significant changes in the concentration indices measured; the results are shown in Table 45.

TABLE 44: ASSET STRUCTURE OF FIRMS IDENTIFIED IN BOARD PACKAGING PRODUCT GROUP

Own Capital (£'000)	No. of firms 1968	No. of firms 1972
0 - 50	30	13
51 - 500	62	66
501 - 1,000	7	8
1,001 - 10,000	7	12
10,001 - 20,000	1	2
20,001 - 50,000	1	1
50,001 - 100,000	0	0
	108	102

The concentration ratios and Linda indices for the product group are shown in the following graphs. It will be noticed that the Linda indices show no distinct minima, suggesting that no oligopolistic grouping exists within the product group. This is the same phenomenon as was observed in the analysis of the entire converting sector discussed in Section 2.5. Because the data for box and fibreboard case manufacturers could not be distinguished, the Linda index is effectively summing two "oligopolies" and producing the results observed. This observation might have proved invalid if separation into two product groups had been possible.

TABLE 45: BOARD PACKAGING, ANALYSIS OF TURNOVER

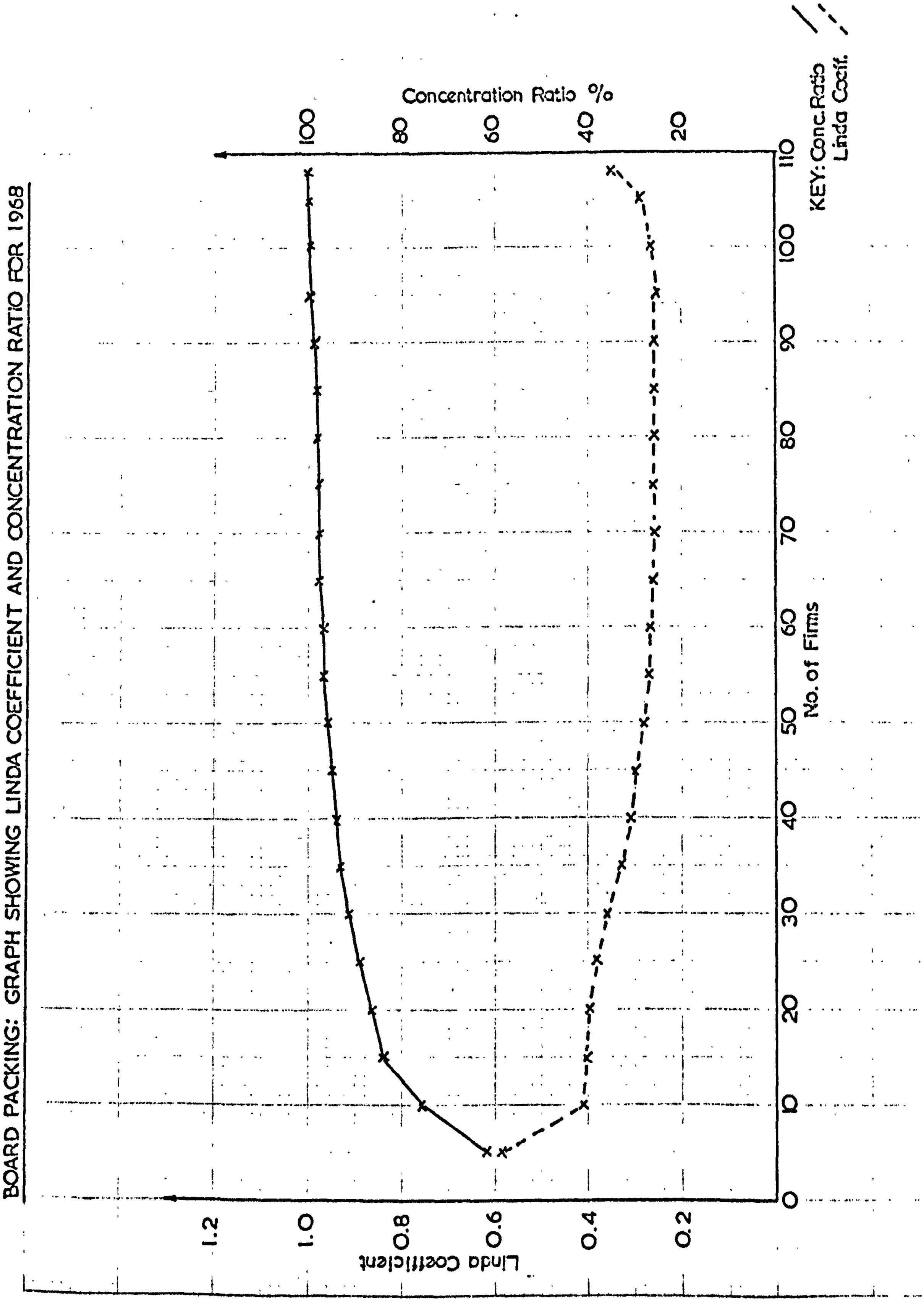
	1968	1969	1970	1971	1972
No. of Companies	108	108	105	102	102
Total Turnover ('000)	236,870	277,035	327,355	334,634	377,922
Mean	2193.241	2565.139	3117.676	3280.725	3705.118
Coefficient of Variation	3.271	3.200	2.971	2.980	2.947
Gini	0.829	0.829	0.822	0.817	0.821
Herfindahl-Hirschmann	108.378	104.126	93.642	96.871	94.977
Entropy	-128.415	-129.191	-131.952	-131.109	-131.107
Linda Index for N* / Concentration Ratios %					
= 2	0.59 / 39.7	J.63 / 37.1	0.65 / 34.2	0.68 / 35.0	0.63 / 34.7
= 10	0.40 / 77.4	0.38 / 76.8	0.36 / 74.4	0.37 / 75.2	0.36 / 74.9
= 20	0.40 / 87.1	0.38 / 87.4	0.30 / 87.8	0.32 / 87.6	0.30 / 88.1
= 40	0.31 / 93.8	0.29 / 94.1	0.29 / 94.6	0.30 / 94.3	0.30 / 94.7
= 50	0.27 / 95.8	0.27 / 96.0	0.28 / 96.2	0.28 / 96.1	0.29 / 96.4
= 60	0.26 / 97.2	0.26 / 97.3	0.27 / 97.5	0.27 / 97.4	0.28 / 97.6
= 80	0.26 / 98.9	0.26 / 99.0	0.26 / 99.1	0.25 / 99.1	0.27 / 99.1
= 100	0.27 / 99.8	0.28 / 99.8	0.29 / 99.9	0.29 / 99.9	0.30 / 99.9

TABLE 46: FINANCIAL STATISTICS OF COMPANIES IDENTIFIED IN BOARD PACKAGING PRODUCT GROUP

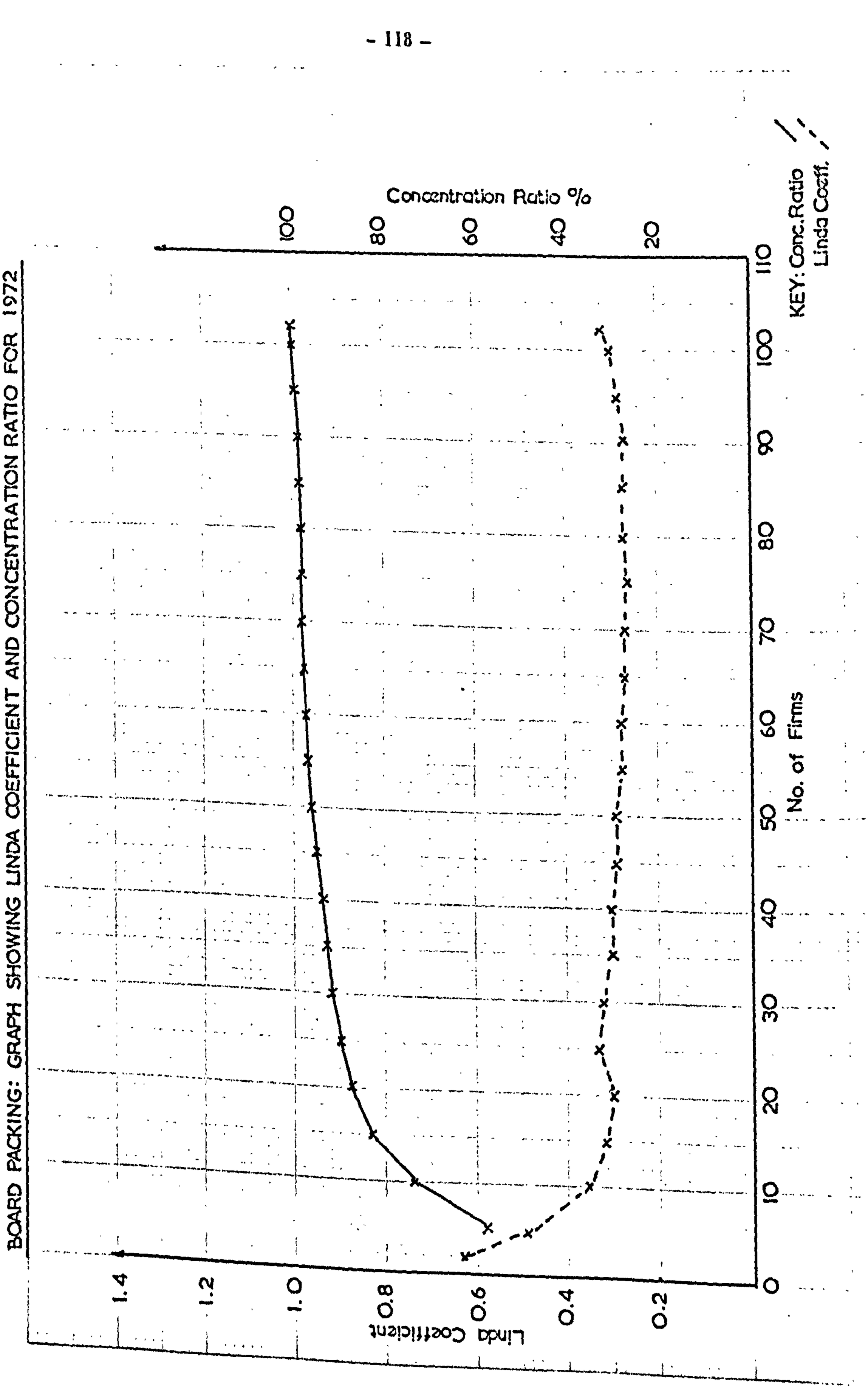
£'000

YEAR	NUMBER OF COMPANIES	TOTAL TURNOVER	TOTAL EXPORTS	PRE-TAX PROFITS	TOTAL NET CASH FLOW	TOTAL EQUITY	TOTAL ANNUAL INVESTMENT
1968	108	236,870	2,130	16,230	14,286	91,444	8,835
1969	108	277,035	3,229	18,836	17,007	92,891	12,180
1970	105	327,356	5,688	17,857	17,362	95,685	18,179
1971	102	334,634	4,533	23,114	21,503	101,959	13,817
1972	102	377,922	5,162	28,133	26,245	108,256	17,712

BOARD PACKING: GRAPH SHOWING LINDA COEFFICIENT AND CONCENTRATION RATIO FOR 1968



BOARD PACKING: GRAPH SHOWING LINDA COEFFICIENT AND CONCENTRATION RATIO FOR 1972



SECTION 4: SUB-SECTION 4

MISCELLANEOUS CONVERTED PRODUCTS GROUP

The miscellaneous manufactures of paper and board sector does not represent an homogeneous product group as has been the case with the other sectors examined. Products classified to this group are diverse including dress patterns, crackers, cigarette filters, paper novelties, doilies and catering paperware. Such a range of products suggest that few conclusions can be drawn from the behaviour of individual firms within the grouping.

The three largest firms classified to this product group are Bunzl Pulp and Paper; Smith & Newphew; and Robinsons & Son. The last two manufacturers produce surgical dressings, babies nappies and other cellulose wadding materials. The subsidiaries of Bunzl Pulp & Paper classified to this sector produce cigarette filter materials, tape, rolls, tubes, etc.

For completeness the tables of analysis are presented below. Table 47 shows the financial statistics relating to the firms in the product group, and Table 48 summarises the concentration indices.

TABLE 47: FINANCIAL STATISTICS OF FIRMS IDENTIFIED IN THE MISCELLANEOUS PRODUCT GROUP

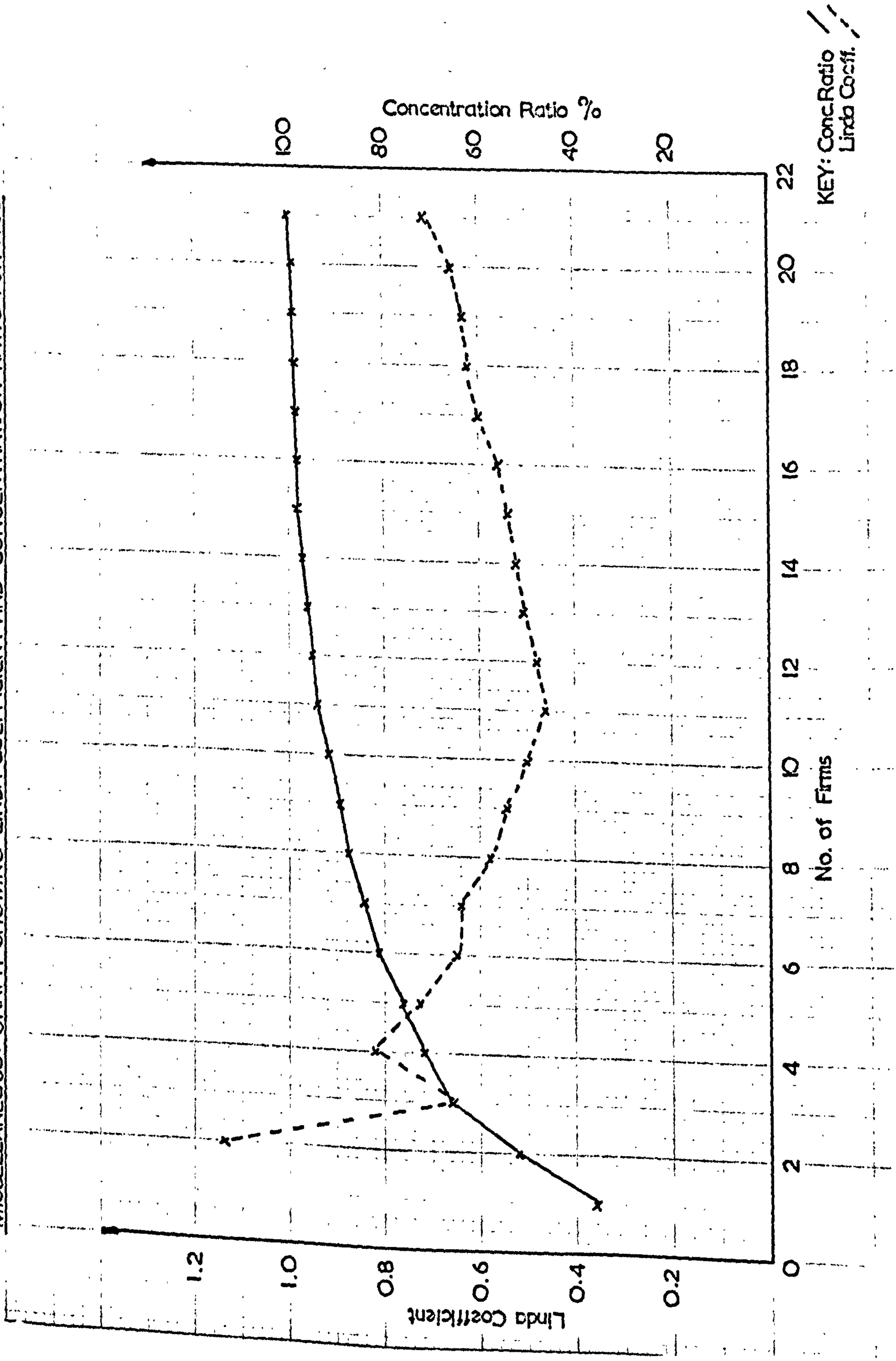
£'000

YEAR	NUMBER OF COMPANIES	TOTAL TURNOVER	TOTAL EXPORTS	PRE-TAX PROFITS	TOTAL NET CASH FLOW	TOTAL EQUITY	TOTAL ANNUAL INVESTMENT
1968	21	63,475	7,468	5,467	4,261	20,199	3,685
1969	21	70,272	8,472	6,582	5,654	22,743	4,112
1970	21	75,090	7,485	5,825	5,872	21,645	3,962
1971	21	79,539	9,710	7,374	7,320	24,945	3,716
1972	21	85,751	9,472	7,921	8,248	26,028	3,303

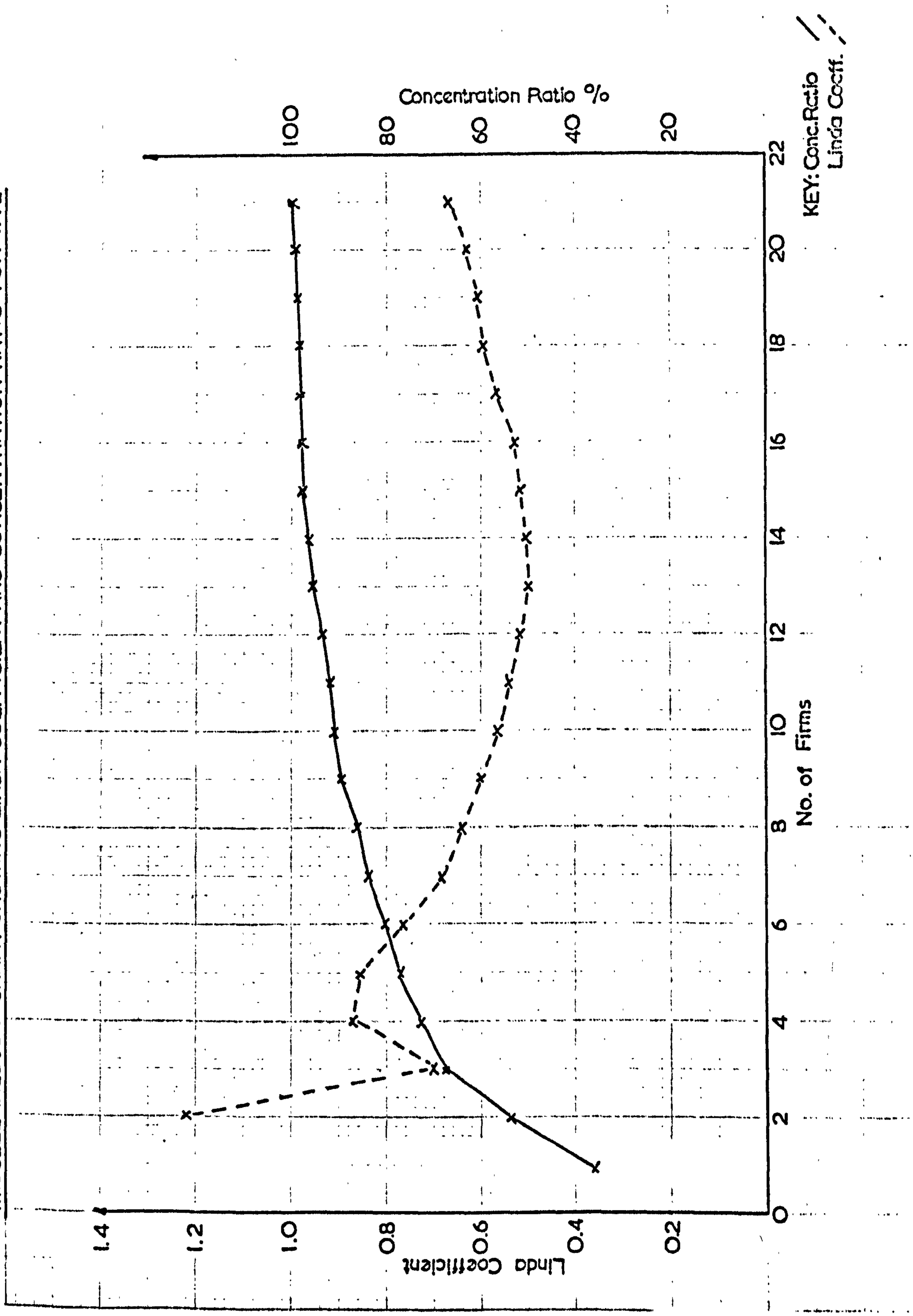
TABLE 48:
MISCELLANEOUS: ANALYSIS OF TURNOVER

	1968	1969	1970	1971	1972
No. of Companies	21	21	21	21	21
Total Turnover ('000)	63,475	70,272	75,090	79,539	85,751
Mean	3022.619	3346.286	3575.714	3787.571	4083.381
Coefficient of Variation	1.711	1.707	1.734	1.790	1.789
Gini	0.678	0.682	0.687	0.689	0.682
Herfindahl-Hirschmann	187.069	186.448	190.926	200.327	200.064
Entropy	- 93.313	- 93.191	- 92.442	- 91.422	- 91.860
Linda Index for N* / Concentration Ratios %					
= 2	1.14 / 51.6	1.20 / 51.0	1.18 / 51.9	1.22 / 53.4	1.22 / 53.4
= 5	0.73 / 76.7	0.70 / 76.7	0.71 / 78.3	0.81 / 77.9	0.86 / 77.3
= 10	0.50 / 91.8	0.49 / 92.4	0.56 / 92.1	0.56 / 91.9	0.57 / 91.1
= 15	0.55 / 97.8	0.54 / 98.1	0.55 / 97.8	0.55 / 97.8	0.52 / 97.6
= 21	0.71 / 100.0	0.85 / 100.0	0.74 / 100.0	0.72 / 100.0	0.67 / 100.0

MISCELLANEOUS: GRAPH SHOWING LINDA COEFFICIENT AND CONCENTRATION RATIO FOR 1968



MISCELLANEOUS : GRAPH SHOWING LINDA COEFFICIENT AND CONCENTRATION RATIO FOR 1972



SECTION 4: SUB-SECTION 5

WALLCOVERINGS PRODUCT GROUP

During the main course of the study the analysis of those firms producing wallpaper and other paper-based wallcoverings has been excluded. It will be noted that in Section 2 the general analysis of the converting sector of the industry excluded wallpaper manufacturers. Instead, the product group is separately analysed in this section.

The reason for this approach is as follows: wallpaper manufacture is essentially a printing process whereby a pattern is applied to a base paper: the production of base paper for wallpaper is included in the manufacture of other printing and writing papers. For this reason, the analysis of the wallcoverings product group has been undertaken separately. the methodology was the same as described for the entire study.

The supply of wallpaper was the subject of a Monopoly Commission[10]. enquiry in the early 1960's. The largest firm in the product group, Wallpaper Manufacturers (WPM) was formed in 1899 by the voluntary amalgamation of thiry-one wallpaper firms. It was a merger-intensive firm throughout its existence until it was itself taken over by Reed Paper (now Reed International) in 1965. In 1899 it claimed to produce 98% of the total output of wallpaper, but since then there has been a downwards trend in this proportion, temporarily reversed by acquisitions. The Monopolies Commission concluded that such acquisitions may be expected to operate against the public interest, and recommended that further acquisitions should not be allowed without the permission of the (then) Board of Trade.

Developments since 1963 have also tended to limit WPM's market share. By 1966, ICI held approximately 10% and had entered the "vinyl" market; WPM were slow to follow. In addition, smaller companies were taken over by larger companies, in several instances with significant paints interests (ICI; Berger, Jenson & Nicholson; and Leyland Paints).

Throughout the period under examination, the product group has continued to be dominated by ICI and WPM, the former having significantly increased their share of the market. ICI is one of the UK's largest companies, being predominantly in the chemical industry. Because of the divisional organisation of the company, it was not possible to isolate from the consolidated accounts the financial statistics relating to their wallpaper interests only.

The financial statistics relating to the remaining companies identified in the product group are summarised in Table 49.

TABLE 49: FINANCIAL STATISTICS RELATING TO COMPANIES IDENTIFIED IN THE WALLCOVERINGS PRODUCT GROUP (Excluding ICI)

Year	No. of Companies	Turnover	Exports	Net Cash Flow	Total Equity	Annual Additions to Investment
1968	8	35,365	3.105	3,870	26,083	1,981
1969	8	46,548	4,297	2,850	26,270	832
1970	8	52,966	5,195	1,534	30,362	1,026
1971	7	47,834	4,965	1,830	29,822	711
1972	8	38,379	4,487	2,480	31,967	1,552

As the statistics collected relating to this product group proved to be incomplete it was decided that any further analysis of concentration would be inconclusive.

APPENDIX A:

Comparison of Concentration Indices for all financial variables relating to companies in manufacturing and converting sectors of the U.K. paper industry;

MANUFACTURE

COMPARISON OF INDICES APPLIED TO DIFFERENT VARIABLES

VARIANCE

	1968	1969	1970	1971	1972
turnover	2.03	2.08	2.10	2.04	2.05
exports	2.16	1.65	2.33	2.05	2.28
profit before tax	1.95	1.75	1.73	1.81	1.72
net cash flow	2.08	1.91	1.77	1.66	1.82
own capital	2.22	2.26	2.28	2.27	2.40
gross investment	2.07	2.14	2.10	2.35	2.70

GINI COEFFICIENT

	1968	1969	1970	1971	1972
turnover	0.728	0.736	0.731	0.719	0.715
exports	0.742	0.706	0.746	0.737	0.753
profit before tax	0.750	0.708	0.703	0.721	0.678
net cash flow	0.753	0.720	0.700	0.693	0.706
own capital	0.766	0.769	0.766	0.766	0.772
gross investment	0.758	0.780	0.761	0.788	0.742

HERFINDAHL-HIRSCHMANN INDEX

	1968	1969	1970	1971	1972
turnover	80.2	82.0	80.8	78.2	78.9
exports	104.93	65.4	105.5	88.5	103.6
profit before tax	81.4	64.5	68.1	75.4	68.4
net cash flow	86.1	72.6	65.7	63.0	68.7
own capital	92.8	94.2	92.2	95.2	102.6
gross investment	82.5	86.1	80.9	98.7	125.8

ENTROPY

	1968	1969	1970	1971	1972
turnover	-133.4	-132.8	-134.5	-135.9	-136.3
exports	-123.8	-134.7	-127.1	-129.3	-126.0
profit before tax	-128.5	-138.2	-135.9	-131.6	-138.0
net cash flow	-129.0	-136.2	-138.6	-138.4	-137.9
own capital	-127.3	-127.3	-128.9	-127.3	-126.2
gross investment	-130.0	-126.7	-131.4	-124.2	-127.5

MANUFACTURE: COMPARISON OF INDICES APPLIED TO DIFFERENT VARIABLES

VARIABLE	1968	1969	1970	1971	1972
Linda index where n* =4 / Conc. ratios					
Turnover	0.410 / 50.5	0.460 / 50.5	0.501 / 49.6	0.482 / 48.9	0.499 / 49.0
Exports	0.654 / 49.5	0.480 / 39.2	0.838 / 46.7	0.649 / 44.6	0.820 / 47.0
Profit before Tax	0.381 / 50.9	0.356 / 43.6	0.378 / 44.7	0.448 / 46.7	0.473 / 43.4
Net Cash Flow	0.435 / 51.2	0.482 / 45.9	0.324 / 44.8	0.322 / 42.9	0.450 / 43.6
Own Capital	0.556 / 52.2	0.586 / 52.2	0.594 / 51.4	0.453 / 54.6	0.523 / 54.8
Gross Investments	0.505 / 47.0	0.477 / 49.6	0.505 / 47.9	0.455 / 55.8	0.980 / 49.3

VARIABLE	1968	1969	1970	1971	1972
Linda index where n* =10 / Conc. ratios					
Turnover	0.326 / 72.6	0.311 / 73.0	0.318 / 71.5	0.312 / 70.3	0.320 / 69.8
Exports	0.341 / 74.1	0.215 / 68.0	0.314 / 71.1	0.269 / 71.9	0.295 / 72.5
Profit before Tax	0.273 / 75.3	0.242 / 68.6	0.260 / 70.3	0.261 / 73.1	0.281 / 67.1
Net Cash Flow	0.316 / 75.7	0.276 / 69.8	0.291 / 67.7	0.258 / 68.2	0.272 / 68.2
Own Capital	0.336 / 76.5	0.347 / 76.0	0.338 / 75.3	0.372 / 76.0	0.394 / 75.8
Gross Investments	0.283 / 73.7	0.264 / 78.2	0.266 / 74.2	0.360 / 78.3	0.383 / 71.8

CONVERSION

COMPARISON OF INDICES APPLIED TO DIFFERENT VARIABLES

VARIANCE

	1968	1969	1970	1971	1972
turnover	4.09	3.97	3.83	3.69	3.49
exports	5.15	4.74	4.22	4.15	3.94
profit before tax	4.02	3.68	4.01	3.53	3.26
net cash flow	3.81	3.66	3.67	3.31	3.07
own capital	4.65	4.42	3.76	4.05	3.94
gross investment	2.89	2.99	3.25	3.47	3.00

GINI COEFFICIENT

	1968	1969	1970	1971	1972
turnover	0.829	0.829	0.831	0.823	0.824
exports	0.905	0.896	0.898	0.905	0.910
profit before tax	0.859	0.847	0.852	0.854	0.840
net cash flow	0.845	0.834	0.837	0.831	0.822
own capital	0.834	0.828	0.777	0.818	0.824
gross investment	0.708	0.809	0.820	0.831	0.826

HERFINDAHL-HIRSCHMANN INDEX

	1968	1969	1970	1971	1972
turnover	98.9	96.4	91.9	91.1	91.1
exports	179.2	156.7	128.4	133.0	133.3
profit before tax	97.3	84.6	101.7	87.4	83.4
net cash flow	87.7	83.7	85.1	75.8	73.6
own capital	126.6	117.9	88.9	108.1	115.2
gross investment	52.7	58.1	67.6	81.2	69.1

ENTROPY

	1968	1969	1970	1971	1972
turnover	-140.3	-140.6	-141.8	-142.0	-140.1
exports	-105.6	-111.5	-116.5	-112.0	-109.8
profit before tax	-136.6	-140.4	-136.7	-136.5	-138.4
net cash flow	-141.2	-143.2	-143.3	-144.1	-143.5
own capital	-134.5	-136.6	-152.1	-139.0	-134.7
gross investment	-166.9	-154.4	-149.9	-142.9	-144.3

CONVERSION

COMPARISON OF INDICES APPLIED TO DIFFERENT VARIABLES

VARIABLE	1968	1969	1970	1971	1972
Linda index where n* =4 / Conc. ratios					
Turnover	0.597 / 54.9	0.549 / 54.6	0.540 / 53.1	0.552 / 52.7	0.538 / 53.0
Exports	0.800 / 72.4	0.735 / 68.6	0.651 / 63.3	0.418 / 68.7	0.449 / 68.0
Profit before Tax	0.567 / 52.7	0.545 / 49.0	0.641 / 51.7	0.492 / 51.5	0.488 / 50.3
Net Cash Flow	0.528 / 49.7	0.531 / 48.7	0.556 / 47.9	0.490 / 46.8	0.439 / 47.0
Own Capital	0.812 / 58.8	0.785 / 57.1	0.704 / 47.4	0.754 / 55.1	0.780 / 56.8
Gross Investments	0.457 / 39.2	0.380 / 42.0	0.528 / 44.5	0.529 / 48.3	0.431 / 45.1

VARIABLE	1968	1969	1970	1971	1972
Linda index where n* =10 / Conc. ratios					
Turnover	0.475 / 71.0	0.480 / 70.3	0.479 / 68.7	0.463 / 68.6	0.467 / 68.7
Exports	0.727 / 87.1	0.598 / 84.8	0.425 / 82.3	0.484 / 85.7	0.474 / 85.7
Profit before Tax	0.384 / 73.5	0.331 / 72.8	0.414 / 72.8	0.354 / 73.3	0.381 / 70.4
Net Cash Flow	0.361 / 70.9	0.353 / 70.1	0.375 / 69.0	0.323 / 69.2	0.342 / 68.4
Own Capital	0.612 / 72.4	0.583 / 71.1	0.461 / 62.0	0.520 / 70.5	0.532 / 72.1
Gross Investments	0.326 / 55.9	0.300 / 60.0	0.327 / 64.0	0.333 / 70.6	0.293 / 68.3

APPENDIX B - TECHNICAL NOTE

COMPARISON OF CONCENTRATION OF FINANCIAL VARIABLES - THE EFFECTS OF DIFFERENT RANKING

Certain methods of comparison have been suggested by economists of the EEC Commission with responsibility for co-ordination of this series of studies.[1]. These depend upon the assumption that ranking of companies is similar, with respect to each of the financial variables. This assumption was found to be invalid in the two sectors of paper manufacturing and conversion.

The authors decided to examine differences in rankings according to each of the variables: turnover, exports, profits, net cash flow, equity and gross investment. The method used was that of rank correlation: firms were arranged in descending order with respect to each variable and simple correlation coefficients were computed between the different rankings of each firm. Two technical questions arose:

(a) because of "bunching" of values of certain variables, might rank correlation coefficients tend to be misleadingly low? This danger was aggravated by the uncertain accuracy of some of the data;

(b) how close to unity should a coefficient be in order to justify the use of the comparative analysis.

In order that any distortion of the kind described in (a) might be avoided, the validity of rank correlation coefficients was checked by examination of correlation between the logarithms of the corresponding series. Because of negative values of some variables (and the evident distorting effects of linear transformations to exclude these) a complete correlation-matrix of logarithms could not be produced. Where they could be calculated, these coefficients were very close to the coefficients of rank correlation.

Question (b) cannot be answered definitively, since the analysis combines both ordinal and cardinal principles. As an intuitive benchmark, it was decided to reject any coefficient which was below 0.900. Because the computation of the two sets of coefficients proved time-consuming, it was decided to confine the analysis to only one year. Because it was the middle year of the period, 1970 was chosen.

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1. R. Linda: Problems of Economic Concentration and Competition (Documenti di lavoro del progetto "Il Sistema Impreditoriale Italiano" No. 2, November 1964. Available in English from the Fondazione Giovanni Agnelli).

The rank correlation coefficients for the 66 manufacturing firms were as follows:

	Turnover	Exports	Net Cash Flow	Profits	Equity
Exports	0.774				
Net cash flow	0.863	0.711			
Profits	0.701	0.541	0.908		
Equity	0.855	0.643	0.792	0.674	
Gross investment	0.870	0.650	0.772	0.590	0.805

Of the 15 coefficients only one (that between profits and net cash flow) exceeded 0.900. Moreover, if the 66 firms were regarded as a random sample of a larger group, none of the other coefficients would be consistent (at the 95% confidence level) with a population coefficient of 0.900[2].

For the converting sector (161 firms), also in 1970, the corresponding matrix is:

	Turnover	Exports	Net Cash Flow	Profits	Equity
Exports	0.774				
Net cash flow	0.839	0.301			
Profits	0.700	0.287	0.922		
Equity	0.828	0.339	0.783	0.667	
Gross investment	0.758	0.289	0.725	0.613	0.664

Once again, the only close rank correlation is between net cash flow and profits. The other values appear too low to justify any further analysis, which depends upon similarity of ranking.

Note that the low values associated with exports are consistent with the observation in Chapter 2, that those converters engaged in exports were generally those with special products or particular links with overseas countries. It was not expected that the ranking by exports would

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2. Using Fisher's transformation, that is the (normally distributed) variable $Z = log\ e\ \frac{1+r}{1-r}$ with a standard deviation of $\sqrt{\frac{1}{n-3}}$

correspond with that by any other variable, especially since exports are, for most firms in this sector, negligible.

APPENDIX C (a)

EXTERNAL TRADE IN MANUFACTURED AND CONVERTED PRODUCTS

EXPORTS BY ORIGINS AND DESTINATIONS

	TOTAL ALL COUNTRIES		COMMONWEALTH		EEC	
MANUFACTURE	m. tonnes	£'000	m. tonnes	£'000	m. tonnes	£'000
newsprint	221	20	18	4	50	5
uncoated p + w	37,132	10,529	14,356	3,680	3,073	875
coated p + w	24,347	8,575	3,239	1,031	5,444	2,006
kraft paper + board	4,766	1,358	1,224	375	804	174
cigarette paper in bulk	440	157	101	37	23	10
other machine-made paper	93,789	17,771	14,735	3,672	50,873	6,649
hand-made papers	19	25	4	3	7	8
greaseproof or parchment paper	2,225	695	474	191	352	110
composite paper or board	2,970	711	1,317	285	247	100
corrugated etc. paper and board	13,399	2,511	5,803	976	840	260
ruled paper + board	2,141	864	593	212	220	121
impregnated paper + board	40,140	12,910	8,653	2,461	8,290	3,509
wallpaper	24,718	11,980	2,002	1,149	16,364	7,269
CONVERSION						
paper bags, paper board, boxes + other containers	21,738	5,898				
packing containers of paper and paper board	20,936	5,500	3,703	1,209	6,376	1,323
stationery	4,915	2,951	2,135	1,212	470	365
exercise books, registers etc.	4,348	3,284	2,073	1,499	262	259
other articles of paper + board	44,011	20,735				
cigarette paper cut to size	1,014	485	294	130	10	6
carbon + other copying papers cut to size	5,224	5,644	1,677	1,482	1,049	1,363
other paper and board cut to size	18,712	6,638	4,690	1,608	3,714	1,150
bobbins, spools, etc.	654	304	122	56	188	55
other articles of paper + board	18,407	7,664	2,863	1,338	4,973	1,706

EXTERNAL TRADE IN MANUFACTURED AND CONVERTED PRODUCTS

IMPORTS BY ORIGINS AND DESTINATIONS

	TOTAL ALL COUNTRIES		COMMONWEALTH		EEC	
MANUFACTURE	m. tonnes	£'000	m. tonnes	£'000	m. tonnes	£'000
newsprint	1,129,456	83,759	526,758	38,903	3,333	248
uncoated p + w	244,999	26,095	11,455	1,234	3,543	831
coated p + w	109,556	15,043	3,389	463	23,710	3,078
kraft paper + board	954,798	80,290	205,473	16,622	8,974	1,338
cigarette paper in bulk	978	356	84	23	570	244
other machine-made paper	369,680	32,488	24,461	1,309	21,472	2,530
hand-made papers	1	6	0	0	0	1
greaseproof or parchment paper	36,369	5,972	123	26	3,018	640
composite paper or board	21,574	1,377	9	2	17,982	1,014
corrugated etc. paper and board	35,919	4,964	4	1	1,784	367
ruled paper + board	178	221	0	1	52	104
impregnated paper + board	147,463	26,286	7,114	1,660	11,030	4,052
wallpaper	2,625	1,045	1	1	1,342	709
CONVERSION						
paper bags, paper board, boxes + other containers	14,600	3,889				
packing containers of paper and paper board	14,555	3,850	160	77	2,333	1,159
stationery	857	411	27	30	174	92
exercise books, registers etc.	2,408	1,577	204	138	822	581
other articles of paper + board	35,675	11,828				
cigarette paper cut to size	1,522	802	115	30	279	143
carbon + other copying papers cut to size	323	457	19	23	101	139
other paper and board cut to size	23,701	7,112	889	442	2,120	1,017
bobbins, spools, etc.	854	328	3	2	348	197
other articles of paper + board	9,275	3,129	117	84	547	505

SUMMARY: UK AND THE EEC "SIX" - BALANCE OF TRADE

£ million

PAPER & BOARD*	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Imports	5.72	6.63	7.35	6.51	5.94	6.77	7.14	8.52	9.71	12.25	15.51
Exports	5.06	5.82	6.54	6.74	7.59	7.44	9.06	11.99	12.56	13.90	21.10
Balance	- 0.66	- 0.81	- 0.81	+ 0.23	+ 1.65	+ 0.67	+1.92	+ 3.47	+ 2.85	+ 1.65	+ 5.59
CONVERTED PRODUCTS											
Imports	1.02	1.12	1.35	1.38	1.52	1.54	2.84	2.28	2.72	2.77	3.85
Exports	1.95	1.92	2.23	2.19	2.32	2.66	3.46	4.33	5.06	6.05	6.24
Balance	+ 0.93	+ 0.80	+ 0.88	+ 0.81	+ 0.80	+ 1.12	+0.62	+ 2.05	+ 2.34	+ 3.28	+ 2.39

PAPER & BOARD based on SITC 641

MANUFACTURES based on SITC 642

British Paper & Board Industry Federation

*includes building board

APPENDIX D : COMPANY PROFILES

Reed International Ltd.
The Dickinson Robinson Group Ltd.
Wiggins-Teape Ltd.
The Bowater Corporation Ltd.

COMPANY PROFILE

REED INTERNATIONAL LIMITED

Reed International Limited is a British based organisation and is the ninth largest U.K. company. It has an annual turnover in excess of £597 million and employs some 80,000 people - 17,000 of them overseas in 44 countries where Reed has interests.

The principal activities of Reed International and its subsidiary companies are the manufacture and merchanting of building products (plastic pipes and guttering, sanitary ware, pitch fibre pipes); wall-coverings including paint, textiles and furnishing fabrics; "do-it-yourself" products; pulp, paper and board products; paper and plastic packaging and stationery; and the printing and publishing of newspapers, consumer and business magazines, books, and other general printing.

The companies carrying out these activities are grouped into five main divisions, and their shares of total turnover in 1973 were as follows:

ANALYSIS OF 1973 TOTAL SALES AND PROFITS

Division	Sales		Profits	
	£m	%	£m	%
Paper & Paper Products	294.4	41	21.3	44
Decorative Products	150.9	21	10.4	21
Publishing & Printing	201.7	28	9.5	20
Building Products	20.3	3	3.5	7
Other Activities	40.8	7	3.7	8
Total	708.1	100	48.4	100

Reed Group Limited

One of the five main divisions - Reed Group Limited - embraces the majority of the paper and board manufacturing and the paper-converting and packaging interests in the U.K.

Reed Group Limited employs some 20,000 people in a total of five separate operating divisions and one service division:

Reed Paper & Board (UK) Ltd. (incl. Spicer-Cowan Ltd.)
Reed Corrugated Cases Ltd.
Reed Medway Division
Field, Sons & Co. Ltd.
Spicers Ltd.
Reed Transport & Shipping Division

Reed Paper & Board (UK) Ltd.

One of the largest manufacturers of paper and board in the world, Reed Paper and Board employs some 8,000 people and produces about one-fifth of the total U.K. output of paper and board on some forty machines at eleven mills.

Products include - newsprint, printing and writing papers, wrapping papers, tissue papers, special purpose papers, printing, packaging and specialty boards.

Through Spicer-Cowan, Reed Paper and Board has the largest paper merchanting organisation in Europe.

Reed Corrugated Cases Ltd.

One of the largest producers of corrugated fibre-board cases in Europe, Reed Corrugated Cases employs over 5,000 at its thirteen factories making over 30 million cases weekly.

The main activity of the company is the production of protective packaging for a wide cross-section of British Industry. In addition, the company offers a packaging advisory service to customers.

A specialist group of factories produces paper tubes, corrugated paper products, corrugated greaseproof and glassines for the food and confectionery industry.

Reed Medway Division

Reed Medway Sacks pioneered the development and utilisation of multi-wall paper sacks in the U.K. for packaging and refuse disposal.

Sacks are currently produced for packaging a wide range of commodities from animal feeds to fuel, and for local authority and industrial refuse disposal.

Field, Sons & Co. Ltd.

This company produces high quality cartons and display boxes, converting over 50,000 tonnes of packaging board each year at its three factories.

Spicers Ltd.

Through Spicers Ltd., Reed is a major manufacturer of envelopes, business and personal stationery, and many other converted paper products, as well as being a coater and laminator of a wide range of basic materials. Spicers employs more than 3,000 people at 24 factories in the U.K.

The Wallpaper Manufacturers Limited

Wallpaper Manufacturers (WPM) became part of Reed in 1965 and is the largest decorating products organisation in the world. 18,000 people are employed in W.P.M.s eight divisions: wallcoverings, paint, household textiles, Polycell (do-it-yourself products), Sanderson, merchanting and two retailing divisions.

The wallcoverings division produces from eight mills in the U.K. over 3,000 designs of wallpapers and vinyls. It has the largest share of the U.K. wallcoverings market and is a strong exporter.

COMPANY PROFILE

THE DICKINSON ROBINSON GROUP

The Dickinson Robinson Group is a British-based organisation employing over 20,000 people in the U.K. Recent statistics* indicate that the Group is one of the most profitable companies in the U.K. paper industry.

The principal activities of the Group are the manufacture and marketing of envelopes, branded stationery and papers, and of packaging materials from paper, board, plastics and metal foils. There are also important activities in specialised engineering. In 1973 the turnover and contribution to trading profit of the Group's activities were as follows:

ANALYSIS OF 1973 TOTAL SALES AND PROFITS

Division	Sales		Profits	
	£m	%	£m	%
Envelopes, stationery and packaging:				
UK:	162.0	69	14.4	68
Overseas:	63.7	27	6.1	29
Engineering	9.5	4	0.8	3
Total	235.2	100	21.3	100

The U.K. companies carrying on these activities are grouped into five principal divisions: the paper and board division; the envelope-making and manufactured stationery division; the packaging division; the consumer products division; and the engineering division.

* Management Today, October 1974

The Paper and Board Division

This division comprises the five mills of John Dickinson & Co. Ltd. engaged in paper and board manufacture, which are as follows:

Croxley Mills, Watford	:	printing, writing and specialty papers
Nash Mills, Hemel Hempstead	:	pulp board
Keynsham Mill, Bristol	:	coated and uncoated MG packaging papers
Fife Paper Mills, Scotland	:	fine papers, MG, carbonless copy papers
Balerno Mills, Balerno	:	carbonless copy papers

Envelope Making and Manufactured Stationery Division

The remaining mills of John Dickinson & Co. Ltd. are engaged in converting the products of the manufacturing division into final product forms, which are as follows:

Aspley, Hemel Hempstead	:	commercial envelopes, paper and film bags, personal stationery, commercial notebooks and drawing books, document wallets and files, paste-boards, printers' cards and continuous stationery; Production machinery for own use.
Malago Works, Bristol	:	paper and film bags for general packaging purposes.
Northern Works, Liverpool	:	commercial envelopes, carrier bags and personal stationery.
Basildon Works, Tottenham	:	commercial envelopes, labels and table stationery; Production machinery for own use.
Leighton Buzzard Factory	:	rigid transparent boxes.

Certain departments within the division specialise in the production of sterilization packaging for use in hospitals.

Packaging Division

Eleven subsidiaries within this division are concerned primarily with paper and board packaging, the remaining seven are engaged in allied activities and distribution. The types of paper and board packaging manufactured are as shown overleaf:

Robinson Sacks	:	multiwall paper sacks, baler bags and refuse sack equipment.
Kent Kraft Mills	:	kraft paper for sacks.
RWP Flexible Packaging	:	flexible packaging, coated papers, laminates of paper, foil and plastic films, packaging systems.
Robinson Cartons and Printing	:	cartons, envelopes, and colour-printed packaging systems.
New Merton Board Mills	:	lined and unlined chipboard and fibreboard combined.
John Laird and Son	:	cartons, boxes, flexible packaging, labels, colour printing, corrugated cases and corrugated greaseproof.
DRG Cups	:	disposable drinking cups, plates and combines.
Shirley Box	:	cartons, rigid boxes and packaging systems.
Robinson Boxes	:	solid and transparent rigid boxes.
DRG Hospital Supplies	:	disposable hospital products.
Robinson Multiple Packaging	:	multi-unit packaging.

Consumer Products Division

This division comprises the three mills of Adhesive Tapes Ltd. and Industrial Sealants Ltd.; the products manufactured include self-adhesive tapes, special adhesives, gummed paper and tapes.

COMPANY PROFILE

WIGGINS TEAPE LTD.

Wiggins Teape Ltd. is the largest manufacturer of fine and specialty papers in the United Kingdom. In addition to being papermakers, Wiggins Teape are also converters and merchants of a wide range of papers and allied products, with twelve paper mills and six factories in Britain and others in Belgium, Eire, Latin America, Africa and Asia. It also has sales offices and warehouses in many parts of the world and is the largest exporter of paper from the U.K.

Wiggins Teape's most important product is carbonless copying paper, produced at the Company's mills in South Wales and Belgium. Other papers which are leaders in their respective fields are natural tracing, photographic, gummed, heat-seal and self-adhesive papers, all produced in the U.K. Cigarette tissue paper is the principal produce in Indian and Brazilian mills.

Total Group turnover exceeded £180 million in 1973; the following table shows a breakdown of total production:

ANALYSIS OF TURNOVER IN 1973

	% of total
Commercial and packaging papers	25
Fine and industrial papers	23
Drawing, office and photographic paper	10
Stationery	6
Gummed paper and adhesives	10
Merchanting	9
Miscellaneous	17
	100%

In 1970 Wiggins Teape Ltd. was taken over by British American Tobacco Co. Ltd. The main activity of British American Tobacco and its subsidiaries is in the tobacco industry, but it also has sizeable interests in retailing and the paper and cosmetics industry.

British American Tobacco is the world's largest manufacturer of tobacco products including cigarettes, cigars and pipe tobacco, although tobacco products are not sold on the domestic U.K. market.

The Group's interests in the cosmetics industry comprise the Yardley, Lentheric, Morny, Germain Monteil, Scandia and Tuvaché companies.

In addition to the 25.6% interest acquired in 1971 in Horten A.G., a leading department store organisation in West Germany, British American Tobacco has acquired other substantial U.K. interests in retailing more recently.

In addition to Wiggins Teape, British American Tobacco is the joint owner with the Imperial Group Ltd. of Mardon Packaging International Ltd., which produces a wide range of packaging and promotional materials in the U.K. and Europe.

The following table shows an analysis of the turnover and profits of the British American Tobacco Co. in 1973:

ANALYSIS OF B.A.T. 1973 TOTAL SALES AND PROFITS

Division	Sales		Profits	
	£m	%	£m	%
Tobacco	2162.1	77	193.7	78
Retail	334.1	12	12.9	5
Paper	230.3	8	18.7	7
Cosmetics	46.2	2	2.5	1
Other activities	35.0	1	21.9	9
Total	2807.7	100	249.7	100

COMPANY PROFILE

THE BOWATER CORPORATION

The Bowater Corporation is a British-based company with significant overseas interests, employing over 20,00 people in the U.K. alone.

The company, through its subsidiaries, is the largest producer of newsprint in the world, as well as being a substantial manufacturer of woodpulp and a wide range of printing and coated stationery, packaging paper, hardboard and other products. Subsidiaries operated in association with Scott Paper Company of the U.S.A. produce, in the U.K. and Australia, household tissues and hygienic paper products.

The company is also an important producer in the packaging industry of both the U.K. and Europe. The following table shows a geographical analysis of company performance:

GEOGRAPHICAL ANALYSIS OF SALES AND PROFITS IN 1973

£m	U.K.	North America	Australasia	Europe	Far East	Other Overseas
Sales	425.6	249.5	91.3	148.0	66.5	17.9
% of total sales	42.6	25.0	9.0	15.0	7.0	1.4
Profit	17.6	17.4	5.6	4.1	3.4	1.1

As part of the company's policy to broaden its base, a Building Products Division was formed in 1970. This division manufactures building components, factory-made housing units, bedroom and dining-room furniture and carpets. An analysis of performance in each of the divisions is shown in the following table:

ANALYSIS OF 1973 TOTAL SALES AND PROFITS

Division	Sales		Profits	
	£m	%	£m	%
Paper and pulp	199.5	20	18.7	38
Packaging	70.7	7	5.7	12
Building products	97.7	10	7.4	15
Tissue products	54.9	6	6.0	12
Trading and transport	576.1	57	11.2	23
Total	998.9	100	49.0	100

The subsidiaries of the Corporation within the U.K. paper industry are described below together with the product markets in which they operate.

Paper Group

Bowaters U.K. Paper Co.	:	Management company; manufacture of newsprint, roll and blade coated papers, printing, stationery and packaging papers.
Bowaters Paper Sales	:	Distributors of products of U.K. Paper Co.
The Donside Paper Co. (50% Bowater/50% Reed Intl.)	:	Blade coated and uncoated papers.

Packaging Group

Bowater Packaging	:	Management and holding company; manufacture of corrugated and solid fibreboard containers, sacks, drums, cartons and other packaging products.
Bowater Containers	:	Distributors of corrugated and solid fibreboard containers of Bowater Packaging.
Bowater Flexible Packaging	:	Distributors of flexible packaging products of Bowater Packaging.
Bowater Industrial Packaging	:	Distributors of sacks, drums, paper and foil products of Bowater Packaging.

APPENDIX E

OFFICIAL GOVERNMENT INDICES OF WHOLESALE PRICES - COMMODITIES PRODUCED IN THE U.K.

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Paper + board (excl. building board	100.0	101.9	104.4	104.9	104.6	113.0	117.3	128.5	136.6	142.5
Paper - uncoated	100.0	101.6	103.6	103.9	103.5	112.3	116.1	126.3	134.4	140.4
Paper - coated	100.0	101.7	103.1	103.8	103.1	111.3	112.9	123.0	128.2	132.9
Board - uncoated	100.0	103.0	108.8	109.7	109.8	116.4	125.4	140.9	151.6	157.8
Board - coated	100.0	103.0	105.3	106.7	107.1	115.7	120.9	131.9	140.9	145.3
Printings + writings (incl. newsprint)	100.0	101.6	103.6	103.7	104.5	114.7	118.2	129.0	136.9	143.1
Food wrapping papers	100.0	102.9	106.5	107.0	105.7	112.9	115.2	122.2	136.1	140.6
Kraft wrapping papers	100.0	102.7	103.5	104.5	101.0	112.3	118.4	130.4	135.3	145.7
Other wrapping + packing papers	100.0	100.6	103.3	103.2	100.9	98.8	n/a*	n/a*	n/a*	n/a*
Household, toilet papers + tissues	100.0	102.2	104.5	105.7	103.4	113.8	116.1	125.4	131.0	138.1
Industrial + special purpose papers	100.0	100.9	102.2	102.8	102.4	111.6	115.4	125.1	135.6	139.7
Packaging boards	100.0	103.2	110.3	111.0	111.2	118.5	128.7	145.8	156.8	162.5
Industrial + special purpose boards	100.0	103.3	104.8	105.5	105.5	109.8	115.1	125.3	135.2	143.1
Cardboard boxes, cartons + fibreboard packing cases	100.0	102.8	108.6	110.2	110.5	114.3	122.7	137.6	148.4	157.2
Paper sacks	100.0	106.1	110.1	112.1	112.7	120.1	117.3	127.6	132.8	143.1
Paper bags	100.0	101.9	104.8	106.0	103.4	108.2	113.0	125.1	134.4	149.0
Manufactured stationery	100.0	100.4	103.1	107.0	107.3	113.1	119.9	132.9	146.4	155.8
Wallpaper	100.0	99.8	100.8	112.7	116.2	129.7	124.2	143.6	157.7	171.4

Department of Trade & Industry
British Paper & Board Industry Fed.

*no longer published by Department of Trade and Industry

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COMMISSION OF THE EUROPEAN COMMUNITIES

A STUDY OF THE EVOLUTION OF CONCENTRATION IN THE UNITED KINGDOM TEXTILE INDUSTRY

by F. Fishwick and R. B. Cornu,
Cranfield School of Management

October 1975

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P R E F A C E

The present volume is part of a series of sectoral studies on the evolution of concentration in the member states of the European Community.

These reports were compiled by the different national Institutes and experts, engaged by the Commission to effect the study programme in question.

Regarding the specific and general interest of these reports and the responsibility taken by the Commission with regard to the European Parliament, they are published wholly in the original version.

The Commission refrains from commenting, only stating that the responsibility for the data and opinions appearing in the reports, rests solely with the Institute or the expert who is the author.

Óther reports on the sectoral programme will be published by the Commission as soon as they are received.

The Commission will also publish a series of documents and tables of syntheses, allowing for international comparisons on the evolution of concentration in the different member states of the Community.

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LIST OF CONTENTS

		Page
	Acknowledgements	VII
Section I	An Outline of the Study and a Summary of Findings	
	A. Activities included	1
	B. Objectives and research methods	3
	C. Summary of following sections	4
Section II	Recent Trends in the Three Sectors	
	A. The UK demand for textile products	9
	B. External trade	11
	C. Prices, output, productivity and employment	17
	D. Financial trends	25
Section III	Influences on the Structure of the Sub-Sectors	
	A. The structure of the industry in the early 1960's	27
	B. Horizontal and vertical integration	31
	C. Concentration among customers	34
	D. The role of the large fibre producers	37
	E. Government policy	39
Section IV	A Statistical Study of Concentration 1963-73	
	A. Methodology	41
	1. Concentration and market forces	41
	2. Coverage and data	42
	3. Definitions and basic properties of concentration indices	46
	B. Changes in concentration 1963-8	51
	C. Concentration of sales turnover 1968-73	56
	D. Concentration of other financial variables 1968-73	63
Section V	Product Market Analysis	
	A. Specialisation	75
	B. Analysis by production process intermediate products	
	1. Preparation for worsted spinning	77
	2. Woollen yarn spinning	77
	3. Worsted yarn spinning	78
	4. Spinning of cotton and man-made fibres	78
	5. Warp-knitting	80
	C. Analysis of selected end-uses	
	1. Hand-knitting yarns	81
	2. Coloured woven woollen tweeds	82
	3. Sewing thread	84
	4. Men's and boys' shirts	85
	5. Sheets and bedding	87
	6. Women's hose	88
Section VI	Concentration and Competition - some concluding comments	91

		Page
Appendices		
Appendix A	List of enterprises showing textile and non-textile activities (UK and world-wide)	96
Appendix B	Tables of Concentration	102
Appendix C	Estimates of total sub-sector sales	170
Appendix D	Tests for correlation of ranking	173
Appendix E	Additional company information	175
	1. Major acquisitions	175
	2. Mergers	179
	3. Financial links between companies	179
	4. Links between boards of directors	182
	5. Family ties	183
Appendix F	Analysis of Major Textile Companies	
	Introduction and comparative results	184
	1. Courtaulds	188
	2. Carrington-Viyella	194
	3. Tootal	200
	4. Coats-Patons	206
	5. Illingworth-Morris	211
	6. Other major companies	
	William Baird/Joseph Dawson	216
	Nottingham Manufacturing Co	218
	Spirella/Vantona	219
Appendix G	Census of Production 1963 and 1968 Analysis of enterprises	221

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SECTION I

AN OUTLINE OF THE STUDY AND A SUMMARY OF FINDINGS

A. THE ACTIVITIES INCLUDED

This report is about concentration and its implications for competition in three sub-sectors of the textile industry: traditionally referred to as cotton, woollen and worsted and hosiery and other knitted goods. The introduction of man-made fibres, which accounted for 71 per cent of all fibres used in the United Kingdom in 1974, and the formation of large groups with interests in all three sub-sectors have blurred the distinctions between them but traditional boundaries remain. These boundaries are partly geographical: the "cotton industry" is concentrated mainly in East Lancashire and Greater Manchester, the "woollen industry" in West Yorkshire and the "hosiery and knitwear industry" (except for some warp- and weft-knitted fabrics) in the East Midlands. Associations of traders and employers, trade unions and technical institutions are still defined on the older boundaries.

The "cotton industry" is now a small remnant of what existed before self-sufficiency and competition from other countries caused the disappearance of its export markets. The scale of its decline is without parallel in Britain:

	1912	1974
Total employment (000's)	710	104
Fabric production (million m^2)	7,100	1,130
Fabric exports (million m^2)	5,700	280

Sources: Textile Council (1912)
Government departments (1974)

The sub-sector encompasses:

(a) the spinning into yarn of cotton and of staple man-made fibres on the cotton system (the addition of flax-spinning to official statistics is of negligible importance because of the declining use of this fibre);

(b) doubling of such yarns and of continuous filament yarns; and

(c) weaving of cloth from yarn spun on the cotton system and/or from man-made filament.

The woollen and worsted industry did not experience a decline during the earlier decades of this century on the same scale as that in Lancashire. There are two reasons for this: less reliance on plain easily manufactured fabrics and no reliance on exports to warm climates. The industry is defined in this report (and in official statistics) to cover:

(a) the preparation and spinning of wool into woollen or worsted yarns (the latter consist of longer-staple fibres, combed before spinning and with less twist in the yarn), the preparation and spinning of man-made fibres on the same systems; and

(b) the weaving of woollen and worsted yarns (including man-made fibre yarns spun on the same systems) into fabric.

The hosiery and other knitted goods sub-sector has expanded since the last war because of the inclusion within it of warp- and weft-knitted fabrics used for a wide variety of purposes, including shirts, trousers, soft furnishings and bedding as well as more familiar knitted garments. Between 1948 and 1968 total employment in this sub-sector increased from 103,000 to 135,000. The official definition of the sub-sector (1971 Census) shows the breadth of its coverage: knitting of fabrics on warp looms; knitting of stockings, socks; knitted garments and other goods including weft-knitted fabrics.

Making up of household textiles and of clothes cut from knitted fabrics is included when it is carried out in the same establishment as the knitting of the fabric.

Because for many purposes cotton-type, woollen- and worsted-type and knitted products are close substitutes, the report also examines concentration in the three sub-sectors combined under the title "textile processing". The report is not directly concerned with the production of artificial and synthetic fibres but, because of the importance of such fibres in all three sub-sectors, the dominant position of the two major British producers and the interests which they have acquired in the processing industries, frequent reference is made in the report to this other sub-sector.

B. THE OBJECTIVES OF THE STUDY AND RESEARCH METHODS

The investigation forms part of a series sponsored by the Commission of the European Communities throughout the European Economic Community. One objective is to provide a detailed statistical analysis of concentration according to a standard methodological framework specified by the Commission; this statistical analysis appears as Appendix B of this report (Tables of Concentration). Another objective is to identify the main factors influencing competition within the sub-sectors and the relationship between this competition and industrial concentration.

The research programme began with a search of statutory accounts of companies identified as operating within one or more of the sub-sectors. Over 500 companies were included in this search, although not all these were included in the statistical analysis (for definitions of samples see the first part of section IV). After the statistical analysis had been completed and certain conclusions drawn, there was a series of discussions with major companies in each of the three sub-sectors, with a sample of some of the smaller undertakings and with each of the major retail concerns, who are the main customers for certain major products.

SUMMARY OF FOLLOWING SECTIONS OF THE REPORT

Section II examines trends in the industry, mainly since 1963. The total market for textiles and clothing has expanded only slowly in recent years and overseas suppliers have obtained an increasing proportion of this market, especially in woven cotton and man-made fibre fabrics, and knitted and made-up clothing. Exports have expanded more slowly. Total production in the woollen textile industry has been falling, mainly because of increased imports of made-up clothing and a static market for woollen carpets. Output in the "cotton" sub-sector has been relatively static while output of hosiery and other knitted goods sector expanded until about 1970 and has then tended also to be static.

Intense competition between home-produced goods and imports, between fibres, between knitted and woven fabrics and between companies within each segment of the industry has been expressed in pricing. The response of companies to these competitive conditions has been increased productivity achieved through capital investment and at the cost of a large cut in employment. Much of this investment and associated reorganisation, especially in the cotton and hosiery and other knitting sub-sectors, was financed by the two major U.K. producers of man-made fibres.

Section III examines influences on the structure of the textile industries. In 1963, in spite of reorganisation under the Cotton Industry Act of 1959 the cotton industry remained much less concentrated than manufacturing industries as a whole - firms with fewer than 1,000 employees accounted for over 40 per cent of employment. The wool and knitting sub-sectors were even more fragmented. This structure contrasted sharply with the virtual duopoly already existing in man-made fibre production.

Another feature of the three sub-sectors was a horizontal rather than vertical structure (the only exception was woollen, as opposed to worsted, spinning and weaving). The need for long runs in spinning contrasted with that for variety in weaving and knitting of all but the plainest fabrics (and most of the market for plain fabrics had long before been lost to overseas products). This horizontal structure increased the industries' vulnerability to inventory cycles and to imports and severely impeded marketing activities. Vertical integration

was economic only if undertakings were sufficiently large to permit variety in weaving and knitting together with long production runs in spinning.

A third feature of these industries,which influenced changes in structure, is the importance of a few major customers - the multiple retailers of clothing and, to a lesser extent, household textiles. The role of these customers in importing, in forcing down prices and in generating sharp changes in demand were emphasised by some manufacturers in discussions with the author. Section III also summarises the views of major retailers on these aspects of their trading. There is little doubt that the predominant position of major customers has created pressure for (a) greater size, to give countervailing selling power, and (b) more vertical integration, to facilitate greater control over supplies and outlets and development of branded textile products.

A major reason for the emergence between 1963 and 1968 of large multi-process vertically integrated groups in the textile industries was the intervention of Courtaulds and I.C.I. Section III traces the history of this intervention: the abortive takeover of Courtaulds by I.C.I., the series of acquisitions in textile processing by Courtaulds (£150 m. in five years) and the investments by them and I.C.I. in other major textile groups. The purpose of this intervention was the preservation of the United Kingdom market for fibres. In view of their fragmented and horizontal structure and the importance of major retail customers, themselves forced by intense competition to seek low-cost supplies, the cotton and hosiery sub-sectors might have contracted very sharply without this assisted reorganisation.

Government policy on mergers in the textile industry has varied. Until 1968 there was a favourable policy towards "rationalisation", which had extended over many years (pre-war legislation affecting cotton spinning had common features with the 1959 Cotton Industry Act). In 1969 the Government announced its opposition towards further acquisitions by fibre manufacturers in textile processing and this has restricted further growth of the largest combines in

the cotton and knitting sub-sectors. The government has continued to encourage amalgamations of smaller firms in the textile industry and rationalisation is one of the objectives of a scheme for the reorganisation of the woollen and worsted sub-sector.

Section IV examines changes in concentration between 1963 and 1968 and between 1968 and 1973. To this latter period the statistical framework of the Commission has been applied in complete detail (the first part of Section IV explains the methodology, the coverage of the data and the meaning of the various indices of concentration).

Between 1963 and 1968 concentration increased appreciably in both cotton and hosiery, mainly because of the intervention of the two fibre producers. In the wool sub-sector less development occurred although Courtaulds acquired some capacity and I.C.I. obtained a minority interest in one of the moderately large independent concerns.

In the period 1968-73 concentration increased more in the wool sub-sector than in cotton or knitting. The increase in concentration was confined to the largest firms in the industry: as a result of acquisition of other large groups, Coats-Paton and Illingworth Morris increased their share of total turnover in the sub-sector from about 19 to 30 per cent. The combined share of the ten largest firms in the woollen and worsted industry remained, however, at 60 per cent in 1973 (the same as in 1968).

In the cotton industry a distinct oligopoly group of four firms was reduced to three at the end of 1970 by the merger which formed Carrington-Viyella Ltd. This merger, brought about by financial pressures and effected by I.C.I., was the only major development. A proposal by Courtaulds in 1969 to take over its then largest competitor, English Calico, was aborted by Government opposition which also prevented any further intervention by fibre producers (other than the Carrington-Viyella case) until 1973. There is evidence that the policy has not changed. Although it changed little over the five years, concentration in cotton remained much greater than in wool: ten firms controlled 73 per cent of turnover in 1968 and 75 per cent in 1973.

In hosiery and knitting also, concentration changed negligibly between 1968 and 1973. As in cotton, there had been a big increase in concentration over the previous five years. In 1968 four firms controlled 53 per cent of turnover and 10 firms just over 72 per cent; in 1973 the two proportions were unchanged. As in cotton, government opposition to further intervention by fibre producers was probably of paramount importance.

One of the more unusual features to emerge from the statistical analysis is the existence of an oligopoly in textile processing as a whole. The degree of concentration in the combination of the three sub-sectors (and vertically integrated dyeing, finishing and distribution) is remarkably high: five firms controlled 57 per cent of all turnover in 1968 and 59 per cent in 1973. One of these five firms is itself a major fibre producer (Courtaulds), in another (Carrington-Viyella) I.C.I. have a majority shareholding and in a third (Tootal) both I.C.I. and Courtaulds hold 8 per cent of equity.

The concentration of profits in the cotton and wool sub-sectors appears to have varied inversely with the state of trade. In the recession of 1969-70 the share of profits obtained by the five largest concerns fell significantly. In hosiery and other knitting the reverse (and more usual) tendency was observed.

Concentration of most other financial variables (cash flow, capital expenditure, equity, net assets and net cash flow) appears to be greater in most years than that of turnover and the firms with the largest turnover tended to account for even greater proportions of these other variables. One exception to this observation was that exports were more evenly distributed among firms in the textile industry. The five largest textile enterprises (apart from Courtaulds) accounted for a much lower proportion of exports than of sales turnover.

Section V examines in some detail the markets for certain product groups, both intermediate products and end-uses. Intermediate products examined are wool tops (for worsted spinning). woollen and

worsted yarns, spun yarns of cotton and man-made fibres and warp-knitted fabrics. End-use products selected for detailed analysis are hand-knitting yarns, coloured tweeds, sewing thread, shirts, bed linen and ladies' hose. In each of these end-uses the importance of supplies from overseas and of major customers in this country is evident.

Section VI relates the findings of the statistical analysis to the wider competitive situation described in Sections II, III and V. The combined effect of vertical integration, of increasing concentration among customers and continuing imports is likely to be a tendency towards greater concentration in the textile industries over the next few years. This tendency is evident from developments occurring at the time of writing. These developments - mergers and acquisitions - generally result, like those of the 1960's, from defensive motives. Unless this is prevented by Government action, this defensive reorganisation is likely to continue for some years.

SECTION II

RECENT TRENDS IN THE THREE SECTORS

INTRODUCTION

Companies in all three sub-sectors have been operating in a continuously competitive environment in recent years. The total market for textiles and clothing in the United Kingdom has expanded only slowly; competition from imports has affected a growing part of this static market and low-cost producers have also competed in export markets. Within the textile industry there has been intensive competition between fibres and between knitted and woven fabrics. The response from companies to this competition has been increased productivity achieved through capital investment and at the cost of a large cut in employment. This investment has reflected the intervention in the industry of large fibre producers eager to preserve the U.K. textile industry as an outlet for their fibres and to ensure the security of their own sales.

A. THE U.K. DEMAND FOR TEXTILE PRODUCTS

An analysis of textile demand by end-uses was produced by the National Economic Development Office (1) for 1970. This analyses consumption of fibres by weight:-

Table 1: End-uses of textile products (by weight), including imports and excluding exports

	%
Made-up clothing (woven or knitted fabrics)	28.2
Knitted garments and hosiery	8.9
Hand-knitting yarn and sewing thread	3.0
Household textiles, furnishings and blankets	14.6
Carpets, linoleum and leathercloth	18.5
Tyre cord	3.4
Other industrial uses and narrow fabrics	18.8
	100.0

Clothing is the largest single end-use for textile fibres in the U.K. and, when knitted garments are included, accounted for 37.1 per cent of 1970 consumption by weight. Consumers' expenditure on clothing has remained in recent years at about 8 per cent of total consumers' expenditure. Between 1963 and 1974 total expenditure rose by 32 per cent and expenditure on clothing by 33 per cent; analysis of data for intervening years confirms that the elasticity of demand for clothing in relation to consumers' expenditure is close to 1 (See footnote 1).

Knitted garments (that is hosiery and garments knitted complete) accounted for between 22 and 25 per cent of annual consumers' expenditure on clothing in each of the years 1963-71 (1); later data are not available. There are few data on the relative importance of knitted and woven fabrics in made-up clothing.

As with that for clothing, demand for household textiles and soft furnishings has grown approximately in proportion to consumers' total expenditure with a 30 per cent growth over the period 1963-74. Analysis of annual data over this period confirms that expenditure-elasticity was close to unity[2]. The shares of knitted and woven fabrics are not known.

The weaving and tufting of carpets do not come within the terms of reference of this report but represent a major market for spun yarns of wool and man-made fibres. In 1974 carpet manufacturers took 6 per cent of the output of the cotton and man-made fibre spinning sector (most of it spun rayon) and 33 per cent of the yarn produced in the woollen industry. In recent years, sales of woven woollen carpets have remained static, in contrast to those of tufted carpets, in which man-made filament fibres predominate:-

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1 A regression equation produced an estimate of 1.036 with a standard error of 0.032.

2 Regression analysis produced an estimate of 0.980 with a standard error of 0.138. The greater instability possibly reflected fluctuations in indirect taxation and new housebuilding.

Manufacturers' sales of woven and tufted carpets in the United Kingdom (million square metres)

	1966	1968	1973	1974
Woven woollen	31.2	31.9	32.9	27.1
Woven man-made	18.1	18.5	20.1	19.7
Tufted	27.5	49.2	102.2	100.1

Most of the smaller categories of end-use have also shown slow growth of demand in recent years. For example, U.K. use of tyre cord (U.K. production - exports + imports) rose by 40 per cent between 1958 and 1963 but the figure for 1973 was less than 1 per cent above that for 1963.

Measured in volume terms, total demand for textile products has grown more slowly than real income in the United Kingdom over the ten years up to 1974. Evidence has been presented elsewhere (2) that this low income-elasticity of demand for textiles is a characteristic of most western European countries.

B. EXTERNAL TRADE

Table 2 shows imports and exports of textile products in 1968 and 1973. Production of man-made fibres (as opposed to processing) has been excluded, but made-up textiles have been included because much of their value content falls within our terms of reference.

Table 2: The value of external trade 1968 and 1973 (£m)

	1968			1973		
Product category	Exports	Imports	Balance	Exports	Imports	Balance
Cotton yarn & thread	10.8	8.8	+2.0	22.0	15.6	+6.4
Spun man-made fibre yarn	4.4	3.6	+0.8	28.1	17.1	+11.0
Woollen & Worsted yarn	20.4	1.9	+18.5	41.6	10.4	+31.2
Woven fabrics - cotton	28.2	67.7	-39.5	39.5	103.5	-64.0
- man-made f.	20.6	33.0	-12.4	49.9	115.4	-65.5
- wool	66.5	8.8	+57.7	91.5	11.8	+79.7
Knitted fabrics	11.4	7.0	+4.4	43.2	12.6	+30.6
Carpets	29.6	18.8	+10.8	78.2	41.5	+36.7
Other textile products	70.7	58.5	+10.3	104.9	121.7	-27.2
TOTAL SPUN YARNS & FABRICS	262.6	208.1	+52.6	498.9	449.6	+38.9
Knitted garments	27.1	44.9	-17.8	70.1	112.8	-42.7
Other clothing	57.4	65.2	-7.8	109.5	220.7	-111.2
TOTAL CLOTHING	84.5	110.1	-25.6	179.6	333.5	-153.9

Source: Textile Industry Statistics Bureau

Since 1974 was a year of international recession, the comparison of 1966 with 1973 probably indicates trends over the survey period more satisfactorily than a comparison with 1974. One recent development which has produced extensive comment within the industry has been a sharp increase in the imports of cotton and man-made fibre spun yarns, from 31,100 tonnes in 1973 to 53,400 tonnes in 1974. The overall trading surplus on spun yarns and fabrics increased in 1974 to £47.9m but the deficit in trade of clothing widened to £172.9m.

One of the reasons why the overall balance of trade in textile products has not worsened more sharply has been a favourable movement in the terms of trade - U.K. export prices have risen more quickly than those of imports. The deterioration in volume terms is shown in the increases in import penetrations and decreasing ratios of exports to imports shown in Table 3.

There are two elements in the growth of imports which affect the U.K. textile industry: (a) the increase in imports of clothing and made-up textiles, of which the fabric contents are also produced overseas (with negligible exceptions) and (b) the increase in imports of intermediate products - fabrics and yarn. Because of the importance of vertical integration in the industry on the part of major producers of man-made fibres, the increased import penetration of the U.K. market for unprocessed staple fibres and filament yarns is also significant to this study of competition. Table 3 shows estimates of import penetration in volume terms for each of the main categories of textile products together with the ratio of imports (in weight or area) to exports (measured in the same way).

$$\text{Import penetration} = 100 \times \frac{\text{Imports}}{\text{Manufacturers' deliveries - exports + imports}}$$

Table 3: Import penetration and export/import ratios

	Import penetration (%)			Ratio of Exports to imports		
	1963	1972	1974	1963	1972	1974
Man-made staple fibre	10	26	26	2.63	2.77	2.53
Continuous filament yarn	5	29	30	5.06	1.50	1.23
Spun Yarns						
Cotton & man-made fibres	5	13	23	0.75	0.64	0.26
Woollen & worsted	1	3	4	7.00	3.50	3.00
Woven fabrics						
Cotton	41	47	55	0.35	0.25	0.24
Man-made fibres	9	37	42	1.33	0.56	0.49
Wool & worsted	11	8	9	3.17	4.88	4.72
Knitted fabrics	6	7	5	1.67	3.88	4.00
Carpets	8	7	13	0.85	2.57	2.24
Made-up clothing	6	13	20	0.59	0.56	0.47
Hosiery & Knitwear	12	23	27	0.49	0.65	0.62

Sources: NEDO and Department of Trade.

Tables 2 and 3 need to be interpreted with care. Those firms making intermediate products such as man-made fibres, yarns and loom-state fabrics, are adversely affected by increased imports of textiles incorporating such products. For example in 1974 imports represented 42 per cent of the volume of man-made fibre fabrics supplied to U.K. customers (mainly makers-up of apparel, household textiles or other end-use products). Of the man-made fibre content of all end-use products, 52 per cent was imported. These "indirect imports" become progressively more significant with movement away from the final market. Indirect imports substantially diminish the duopoly position of the two major producers of man-made fibres and contributed to their policies described in Section III of vertical integration in the textile processing and consumer-product industries.

The Geographical Pattern of Trade

Most of the United Kingdom's textile imports originate from the Far East or from the Mediterranean. In contrast, the main markets for exports are western Europe and (to a lesser extent) North America. The following table shows total trade in textiles and made-up clothing in 1973. (See note at end of table).

TABLE 4: THE GEOGRAPHICAL PATTERN OF TRADE 1973 (£m)

Country (a)	U.K. imports from (a) Textiles	Clothing	U.K. exports to (a) Textiles	Clothing	Overall Trade Balance
Republic of Ireland	50.9	30.0	46.3	21.1	-13.5
Italy	28.4	10.3	13.5	3.7	-21.5
Other E.E.C.	124.0	33.4	116.0	41.7	+0.3
E.E.C. Total	203.3	73.7	175.8	66.5	-34.7
Portugal	38.7	29.1	11.7	2.7	-53.4
Other Western Europe	98.7	46.0	126.9	49.4	+31.6
U.S.S.R. & E. Europe	11.1	9.7	24.9	3.5	+7.6
North America	45.7	4.7	70.5	29.6	+49.7
Pakistan	9.4	1.1	0.9	-	+49.7
India	28.0	4.7	0.6	-	-32.1
Taiwan	5.6	18.7	0.3	-	-24.0
Hong Kong	33.8	123.4	12.7	2.9	-141.6
S. Korea	4.5	8.4	-	-	-12.9
Japan	9.6	3.4	29.7	3.7	+20.4
Total of above six	90.9	159.7	44.2	6.6	-199.8
All countries n.e.s.	26.5	10.6	135.6	21.3	+119.8
WORLD TOTAL	514.9	333.5	589.6	179.6	-79.2

Note: Owing to the degree of detail published in official statistics, it was not possible to produce Table 4 for exactly the same data as those in Table 2. Table 4 includes man-made filament yarn and does not include carpets. Total imports of filament yarn in 1973 were £70.7 millions and exports £110.0 millions; for carpets the corresponding figures were £41.5 millions and £78.2 millions.

Restrictions on Imports of Textile Products

Until 1959 imports of textile fabrics were allowed into the United Kingdom free of duty if they originated in Commonwealth countries. This explains the emergence of Hong Kong as a major supplier. Subsequently, rising "ceilings" (quotas) were imposed on cotton textiles from such sources to prevent disruption of the domestic industry (under the provisions of article 19 of GATT).

From February 1962 until the end of 1973, restrictions on trade in cotton textiles were regulated by a Long Term Arrangement negotiated by 50 member countries of GATT, which provided for expansion of sales by developing countries but also for protective quotas to prevent disruptive effects. Because the U.K.'s policies at that time were among the most liberal and any increase in restrictions was subject to external scrutiny, they remained more liberal than those of most other western European countries.

Quotas are regarded as preferred to tariffs by most enterprises in the industry which express the fear that imports may be subsidised in order that foreign exchange may be gained. Although quotas were to have been replaced by tariffs in January 1972, they were retained (because of industry pressure) at a higher level and accompanied by tariffs. Quotas were confined to cotton goods and during 1972 there was a switch by Asian producers to fabrics containing more than five per cent man-made fibres. During 1973 the quotas were extended to certain man-made fibre fabrics.

Table 4 showed that most imports from Hong Kong and nearby Asian countries now consist of made-up and knitted clothing and since early 1973 restrictions have been widened to a range of clothing. Under E.E.C. arrangements,

restrictions are specific to individual countries.

These arrangements are now subject to a four-year multiple-fibre agreement reached in December 1973 by 50 countries of GATT. This agreement, which set-up a Textile Surveillance body, concerns most textile products - tops, yarns, piece-goods, made-up articles, garments and other products of cotton, wool, man-made fibres or blends thereof. No new unilateral or bilateral restraints are to be placed on trade in textiles unless specifically authorised under the provisions of the arrangement; all existing restraints were to be "notified immediately and thereafter to be either phased out or justified under the provisions of the arrangement". Phasing-out is to be within three years of April 1974. New restrictions can be introduced under strict conditions and multilateral surveillance; they can apply only to precise products and specific countries. They are essentially temporary and quotas on imports from developing countries are to be enlarged automatically by six per cent per year.

The 1973 multi-fibre agreement appears to prevent the imposition of more severe restrictions on imports of textiles into the U.K. The expansion of textile imports may, however, be restrained by membership of the European Economic Community which negotiates as a single unit under the GATT arrangement. Recent proposals put forward by the Commission of the European Communities provide for a wider sharing of textile imports from developing countries among members of the Community. Textile imports may remain fairly static over the next two or three years but in the longer term, restrictions are unlikely to provide continuing protection.

C. PRICES, OUTPUT, PRODUCTIVITY AND EMPLOYMENT

There are several different elements of competition within the textile industry:-

1. Between fibres: cotton, wool, flax and a widening variety of man-made fibres available in staple or filament form. Competition between rival producers of synthetic and cellulosic fibres is affected by their investments in textile processing.

2. Between alternative methods of fabric production: many end-uses are now supplied by woven, warp-knitted or weft-knitted fabrics. These processes are usually carried out in different establishments and individual companies have differing degrees of investment in each.

3. Between home-produced and imported fibres, yarns and fabrics: this element of competition is complicated by the importation of intermediate products by some firms engaged more heavily in the later stages of production.

This intensely competitive environment is to some extent reflected in trends in wholesale prices of textile products. These prices also reflect the changing costs of raw materials, especially the increasing prices of natural fibres in relation to those of man-made. Table 5 shows that until 1970 the prices of man-made fibre textile products rose more slowly than the general price level. In the case of natural fibre yarns and fabrics, prices rose much less than those of the raw material content in 1973.

TABLE 5: SELECTED PRICE INDICES 1963-74 (1963=100)

	1968	1970	1973	1974
Raw cotton (1)	130	116	246	265
Raw Wool (2)	99	81	291	215
Man-made fibres (3)	86	90	95	124
Man-made spun yarns	100	108	136	171
Cotton and mixture yarns	130	144	207	274
Cotton cloth (loomstate)	124	144	200	279
Man-made fibre cloth (loomstate)	106	114	150	196
Worsted yarns	97	100	189	190
Hosiery and knitwear	98	99	115	138
Made-up clothing	109	115	138	160
Prices of all manufactured products	117	128	158	194

(1) refers to c.i.f. price of cotton landed at Liverpool from New Orleans.

(2) refers to the average price at selected auctions of Merino 64s (source of these data U.N. Monthly Bulletin of Statistics).

(3) this and all following indices refer to wholesale prices and are calculated by the Department of Industry (or its predecessors).

Their falling cost in relation to that of cotton has encouraged an acceleration of the shift to man-made fibres in the "cotton" industry before 1970 and the rapid rises in the prices of both cotton and wool during 1972 and 1973 led to more widespread replacement of these fibres:-

Table 6: U.K. mill consumption by category of fibre (000 metric tonnes)

	1966	1968	1970	1973	1974
Man-made	340	432	469	627	560
Cotton	206	172	166	126	112
Wool	187	189	163	149	121
Total	733	793	795	902	793
Man-made as % of total	46.4	54.5	59.0	69.5	70.6

Source: Textile Industry Statistics Bureau (Quarterly Review)

Although the switch from natural to man-made fibres occurred partly within the traditional weaving industries, it also reflected the increased adoption of knitted in place of woven fabrics. In 1973 warp knitting absorbed 15 per cent of the total U.K. output of filament yarn, 1.8 times as much as weaving. Weft knitters absorbed 15 per cent of the output of yarns spun on the cotton system.

The competition between woven and knitted fabrics is considerably affected by fashion and by technological developments in man-made fibres. For example in both shirts and bedding the advance of warp-knitted nylon fabrics has been reversed in 1973 and 1974 by the popularity of woven polyester and cotton mixtures. Table 7 shows indices of production for major sectors of the industry:-

Table 7: Indices of Production (1963=100)

	1968	1970	1972	1973	1974
Man-made fibre production	201	238	255	303	265
Cotton & m.m.f. spinning and weaving	99	101	100	106	97
Wool and worsted spinning and weaving	93	85	83	83	74
Knitting	132	149	149	153	146

Source: Textile Industry Statistics Bureau (Quarterly Review)

Some indications of the relative importance of the three sectors covered by this study is given by a comparison of net output (value added). In Table 8 value-added in each sub-sector is shown as a percentage of the total of the three sub-sectors combined. (This method of comparison avoids the distorting effect of inflation on the absolute figures.)

TABLE 8: VALUE ADDED WITHIN EACH SECTOR

Sector	1963 (%)	1968 (%)	1971 (%)
Spinning & weaving of cotton and man-made fibres	33	33	34
Wool & worsted	41	34	31
Hosiery & other knitted goods	26	34	35

Source: Censuses of Production

Further evidence of the competitive pressures on the textile industries is provided by the rapid rise in labour productivity since the late 1950's. With falling sales, this increased productivity has been accompanied by decreased employment:-

TABLE 9: EMPLOYMENT AND PRODUCTIVITY 1963-74

		1963	1968	1973	1974
Spinning & weaving of cotton & man-made fibres					
Employees: (000's)	Male	80.8	77.5	61.4	58.3
	Female	118.1	86.7	50.0	45.7
Total		198.9	164.2	111.4	104.0
Index of Employment		100	83	56	52
Index of Output		100	99	106	97
Index of Productivity		100	120	189	186
Wool and Worsted					
Employees: (000's)	Male	89.1	78.6	56.0	51.8
	Female	99.2	74.3	47.9	43.2
Total		188.3	152.9	103.9	95.0
Index of Employment		100	81	55	50
Index of Output		100	93	83	74
Index of Productivity		100	115	151	148
Hosiery & Knitwear					
Employees: (000's)	Male	38.2	44.0	42.4	41.7
	Female	89.4	90.9	82.4	80.9
Total		127.6	134.9	124.8	122.7
Index of Employment		100	106	98	96
Index of Output		100	132	153	146
Index of Productivity		100	125	156	152

Source: Department of Employment and Department of Industry

Note that part-time employees are included on a "full-time equivalent" basis.

The greatest increases in productivity have occurred in the spinning and weaving of cotton and man-made fibres, though even in this sub-sector there was a deterioration in the 1974 recession. The increased productivity has been achieved through capital expenditure, much of it financed by the largest enterprises. In 1968 the 19 largest employers in weaving accounted for 44 per cent of employment and 66 per cent of capital expenditure. In spinning, the corresponding proportions for the 15 largest employers were 59 and 71 per cent. In order to maximise utilisation of the new equipment most firms have introduced shift-working and total capacity has been correspondingly reduced.

Table 10: Capacity in Spinning and Weaving (000's)

	1968	1973
Spindles in place	3,860	2,660
Spindles running (average)	3,470	2,470
% operating on three shifts or on 7-day working	26	45
Looms in place	90.1	54.9
Looms running	77.3	48.7
% operating on three shifts or 7-day working	23	35

The widespread use of shiftwork in the "cotton industry" is one reason for the growing proportion of males in the labour force. A large part of the labour force on night shifts consists of Commonwealth immigrants.

The wool and worsted sub-sector had much less capital expenditure than cotton spinning and weaving and hosiery and knitwear during the survey period.
This is shown in Table 11:-

Table 11: Expenditure on Plant and Machinery (Gross) Per Employee

	1968	1970	1971
Cotton and m.m.f. spinning & weaving	179.8	163.7	147.6
Wool & Worsted	96.4	105.6	112.8
Hosiery & Knitwear	162.5	182.1	182.3

Source: Censuses of Production 1970 and 1971
Note that figures are at current prices and not adjusted for inflation.

This lower rate of capital expenditure may be associated with the more fragmented structure of the woollen industry (see Section III) and with the decline in total sales by this sub-sector.

In the hosiery and knitwear sub-sector a major objective of capital investment has been to increase capacity. Of the three sub-sectors this had the highest productivity in the survey period, but Census figures confirm that productivity increases were greater in the other sub-sectors.

Table 12: Value added per Employee (£ - current prices)

	1968	1970	1971	% increase 1968-71
Cotton etc.	1300	1496	1615	24
Wool & Worsted	1415	1487	1668	18
Hosiery & Knitwear	1475	1538	1676	14

Data on wage earnings show that (in spite of the high proportions receiving shift premia in the "cotton industry") average earnings in all three sub-sectors were less than those in manufacturing as a whole:-

Table 13: Earnings and shiftwork in April 1973 (Full-time manual workers)

	Average hourly earnings (pence)		% receiving shift premium	
	Men	Women	Men	Women
Cotton etc. spinning	70.6	48.8	24.3	8.1
Cotton etc. weaving	74.6	48.6	20.6	10.9
Wool & Worsted	69.3	44.1	19.1	2.4
Hosiery & Knitwear	81.0	50.2	11.5	0.0
All Manufacturing	83.6	49.5	22.6	5.2

Source: Department of Employment, New Earnings Survey.

Table 9 showed a loss of 193,100 jobs in the cotton and woollen industries between 1963 and 1974. The progressive decline in employment in the cotton and woollen industries has led to an ageing labour force and a consequently high rate of natural wastage but the social consequences of reduced employment are aggravated by geographical concentration.

In the "cotton industry" over 80 per cent of employment is concentrated in East Lancashire, Greater Manchester and immediately adjacent parts of other counties. Over 70 per cent of the woollen industry is located in West Yorkshire. The economic consequences for many Pennine towns of the decline of textile employment are a major pressure for greater trade protection.

The Knitting industry is less concentrated: about 55 per cent of employment in hosiery and weft knitting is in the East Midlands and 15 per cent in southern Scotland; about 40 per cent of employees in warp knitting are in the East Midlands and 25 per cent in the North-West (Lancashire, Merseyside or Greater Manchester).

D. FINANCIAL TRENDS

No official data are published on company profits within individual sub-sectors and estimates of profits must be based on examination of company accounts. The data collected for this report refer to firms with a turnover of over £1 million, subject to a maximum of 60[1]. Because of increasing concentration, especially in the wool sub-sector, the proportion of industry turnover represented by the samples increased progressively during the survey period. (this is discussed in Sections III and IV.) The following table shows total turnover and net results (including both profits and losses) in each sub-sector sample annually from 1968 to 1973. Absolute figures are not corrected for inflation.

TABLE 14 : TURNOVER AND NET PROFIT BEFORE TAX - SAMPLE DATA

		(a) Turnover £m.	% of industry	(b) Net Results £m.	(b) % of (a)
Wool	1968	315.3	55	16.5	5.2
	1969	341.0	-	13.4	3.9
	1970	333.8	56	9.0	2.7
	1971	346.2	62	11.8	3.4
	1972	398.2	64	25.6	6.4
	1973	499.7	65	34.9	7.0
Cotton	1968	386.1	73	21.7	5.6
	1969	415.0	74	20.0	4.8
	1970	425.8	75	18.9	4.4
	1971	457.8	77	19.2	4.2
	1972	501.2	80	26.3	5.3
	1973	590.2	82	37.5	6.4
Hosiery	1968	364.7	79	25.5	7.0
	1969	392.2	-	23.0	5.9
	1970	431.2	77	22.8	5.3
	1971	461.6	85	29.0	6.3
	1972	483.0	86	32.9	6.8
	1973	583.8	89	41.8	7.2

[1] In one instance (Wool 1970) the maximum was extended to 61, as there was a discrete gap in the distribution of sales turnover after the 61st firm.

These data show that in all three sub-sectors there was a decline in profitability in 1969 and 1970 and that in all three sub-sectors profits as a percentage of sales did not recover to their 1968 level until 1973. This period of reduced profitability can be attributed to falling (or levelling off) of demand (see Table 7) accompanied by increases in costs of natural fibres and of labour. The 1973 boom in demand led not only to fuller utilisation of capacity but also to increases in margins.

Since 1973 the three sub-sectors have been severely hit by trade depression (in common with textile industries throughout the world) which has once again led to "weak" selling and to reduced profit margins.

SECTION III

INFLUENCES ON THE STRUCTURE OF THE SUB-SECTORS

A. THE STRUCTURE OF THE INDUSTRY IN THE EARLY 1960's

Table 15 shows the distributions of enterprises by size of employment in cotton spinning, cotton weaving, woollen and worsted and hosiery and knitting in 1963:-

TABLE 15 : CLASSIFICATION OF ENTERPRISES BY SIZE OF EMPLOYMENT

No. of employees	Cotton etc. Spinning	Cotton etc. Weaving	Woollen & Worsted	Hosiery & Knitting
1 - 99	191	277	790	681
100 - 199	44	109	154	95
200 - 499	55	81	133	64
500 - 1999	36	28	63	52
2000 and over	8	5	7	5
Total of above categories	334	500	1147	897
Firms reporting unsatisfactorily	11	29	44	40
TOTAL NO. OF FIRMS	345	529	1191	937
Total employment (000's)	104.3	89.1	177.1	124.5

Source: 1963 Census of Production

The official separation of spinning and weaving overstates the number of enterprises in the cotton industry because of the double-counting of vertically integrated enterprises. There were about 80 such firms controlling

about 70 per cent of spinning capacity and around 40 per cent of looms in weaving.[1]

The structure of the cotton industry had been changed considerably during its long period of contraction partly as a result of government action. Before the 1939-45 war legislation had been introduced to give legal enforcement to the Yarn Spinners Price Agreement which set common prices and to empower spinners' organisations to purchase compulsorily excess spindle capacity. (This common price list was declared illegal by the Restrictive Practices Court in the late 1950's). Although one or two large spinning combines resulted from the pre-war groupings, the weaving sector remained highly fragmented and many small spinning concerns continued to compete within the industry. The existence of excess capacity and the associated danger of "cut-throat" (= marginal cost) pricing were widely regarded as deterrents to re-equipment within the industry. The view that such re-equipment was essential to the stabilisation of the cotton industry found expression in the Cotton Industry Act 1959.

Under this legislation, the Government compensated firms for scrappage of machinery with additional grants to companies ceasing to trade in the textile industry. It also subsidised the purchase of new equipment. In total £17.1 millions were paid out for scrappage and £13.4 millions for re-equipment. The number of firms in the cotton spinning and weaving industries fell sharply:-

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[1] Estimates based on references (3) and (4).

TABLE 16 : THE STRUCTURE OF THE COTTON INDUSTRY 1958-63

Analysis of companies with at least 100 employees and engaged in the spinning and/or weaving of cotton and/or man-made fibres:

	1958			1963		
Size of firm (No. of employees)	No. of firms	Total Empt. (000s)	Net Output (£mill)	No. of firms	Total Empt. (000s)	Net Output (£mill)
100-499	379	81.3	48.6	223	51.1	40.9
500-999	58	41.7	20.9	34	24.3	17.3
1000-4999	38	73.7	41.3	26	54.0	45.5
5000 & over	7	63.9	38.6	6	56.6	49.8
TOTAL	482	260.6	149.4	289	185.9	153.5

Source: Census of Production, 1963

Neither the wool textile nor the hosiery and knitwear industries underwent the degree of reorganisation which took place in cotton in the early 1960s. In both sub-sectors (as was shown in Table 15) there was a preponderance of very small firms.

All three sub-sectors were much more fragmented than manufacturing industry as a whole and this fragmented structure contrasted with the virtual duopoly already existing in the supply of man-made fibres. Five-firm concentration ratios from the five-yearly production censuses show that for only isolated products of the textile processing sector (as well as the supply of man-made fibres) was the market dominated by five (or fewer) firms.

TABLE 17: FIVE FIRM CONCENTRATION RATIOS 1958, 1963 and 1968

	Combined sales of five largest firms as % of total sales of selected products.		
	1958	1963	1968
Man-made fibres	n.a.	99.9	100.0
Finished thread for sewing etc.	n.a.	81.8	87.9
Single cotton or m.m.f. spun yarn	31.9	37.2	50.3
Doubled cotton or m.m.f. spun yarn	34.9	41.7	47.1
Woven cotton cloth	11.6	19.3	31.2
Woven m.m.f. cloth	21.1	35.8	51.9
Wool tops	30.1	34.0	54.7
Yarn of animal hair or m.m.f. - spun on woollen system	26.7	26.0	33.9
- spun on worsted system	25.8	32.9	40.2
Woven woollen fabric	12.0	15.1	24.0
Woven worsted fabric	17.3	26.7	31.0
Knitted fabrics	30.2	34.7	43.2
Socks, stockings etc	21.4	20.1	43.3
Underwear and shirts	25.6	39.5	53.1

Source: Census of Production

From this table it can be seen that for a number of products the combined market share of the five largest firms increased by more than ten per cent of the total market. These were single yarns spun on the cotton system, woven cotton and man-made fibre cloths, wool tops (for worsteds), socks and stockings and underwear and shirts. Except in the case of wool tops, a major cause of increased concentration was the intervention of the large producers of man-made fibres, seeking to strengthen the structure of those parts of the textile industry which were their main customers.

B. HORIZONTAL AND VERTICAL INTEGRATION

Although some activities have remained vertically integrated since the early nineteenth century (for example woollen blanket manufacture), the textile industries were mainly organised on a horizontal basis for the first 60 years of this century. In the cotton and worsted industries separate firms carried out most of the top-making (worsted), spinning, weaving and finishing. Intermediate processes such as winding or beaming, sizing or yarn-dyeing were, in many cases, also carried out on a commission basis by specialists in each process.

The predominantly horizontal structure of the cotton industry developed in the later part of the nineteenth century, and was due to economies of long production runs in spinning and the need for variety of yarns in weaving of all but the plainest of fabrics. Except for some companies with a large output of a limited range of standard cloths (e.g. surgical gauze), integrated mills remain exceptional. Even in such mills it is usual practice to sell some yarn to other weavers and to purchase yarn from other spinners. Vertical integration under these conditions is economic only when the firm concerned is sufficiently large to control several spinning mills and thereby combine product variety with long runs.

Another deterrent, of increasing importance, to vertical integration between small firms in the cotton industry during the 1960's was the growing proportion of yarn sold to knitters and other non-weavers, most of them located outside the Lancashire area. In 1957 weavers absorbed 74 per cent of spun yarn produced within the United Kingdom; by 1967 the proportion had fallen to 58 per cent.[1]

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1 The Textile Council: Cotton and Allied Textiles, 1969, p. 149

In the woollen industry the difference between woollen and worsted production is quite pronounced. In the manufacture of woollen fabrics the majority of weaving concerns spin their own yarn; this has been attributed[2] to the importance of raw material blending to the quality and profitability of woollen cloth. In 1967, 68 per cent of woollen yarns produced by companies engaged predominantly within the industry went into weaving. The other main demand was from carpet manufacturers. (Some carpet manufacturers spun part of their own yarn requirements). Those wool spinning firms which were not engaged also in weaving were mainly concerned with carpet yarns.

In worsted spinning vertical integration is less economic because only about 40 per cent of worsted yarn goes into weaving, the rest going into knitwear, hand knitting and (to a lesser extent than woollen yarns) carpets. The worsted weaver also requires a variety of yarns and, as in the cotton industry, there is a contrast between economies of long runs in worsted top making and yarn spinning on the one hand and smaller machine units and variety of yarn inputs in weaving on the other.

In both the cotton and wool textile industries the traditional practice was for cloth to be sold to merchants or "converters". Forward integration by textile firms into made-up clothing, household textiles or industrial products remained exceptional and the majority of producers were, therefore, at least one stage removed from the manufacture of the final consumer product.

This separation from the final market subjected manufacturers to a number of disadvantages:-

1) fluctuations in demand resulting from inventory adjustments of merchants and retailers

2) a tendency for some customers to switch to imported fabrics and to market products made from these under the same brand names as similar products made from U.K. cloths

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2 W. S. Atkins and Partners: The Strategic Future of the Wool Textile Industry, NEDO 1969.

3) weak bargaining power in dealings with multiple retailers dominating certain parts of the consumer textile market - shirts, men's underwear and nightwear, children's wear, made-to-measure suits are some examples. Large groups could take advantage of the fragmented structure of the U.K. industries and the facility for importation

4) inability to use advertising and sales promotion to influence the final purchaser

5) inability to influence the choice between knitted and woven fabrics in the making-up of household textiles and clothing.

Conclusions on vertical integration in the 1960's

(1) In the "cotton" industry the need for long production runs in spinning and yarn variety in many kinds of weaving meant that integration would be economic only for very large enterprises, able to combine economies of scale with variety.

(2) The future size of the "cotton" industry depended partly upon links with the final market through forward integration. Control over both weaving and knitting capacity would be a further safeguard against fashion changes between these two types of fabric production.

(3) In the wool industry vertical integration in woollen spinning and weaving was traditional but worsted spinning and weaving remained separate partly because of the importance of yarn sales to activities other than weaving and partly because of the need for variety of yarn in worsted weaving. The industry's needs for links with final customers was similar to that of the cotton industry though the industry was less vulnerable to imported cloths.

C. CONCENTRATION AMONG CUSTOMERS

The fragmented textile processing industries of the early 1960's were facing increasing concentration among customers. An oligopsony situation existed not only for industrial products such as tyre cord, which went to a small number of tyre producers, but also for products sold by multiple retailers. Such products include many kinds of knitwear, shirts, underwear, hosiery, men's suits and certain household textiles.

The percentages of total retail turnover in 1966 accounted for by multiples with 10 or more establishments were as follows:-

Household textiles and soft furnishings	25
Men's and boys' wear	46
Women's, girls' and infants' wear and other drapery goods	40

Source: Census of Distribution 1966

(The use of these broad categories conceals the concentration of retail sales of individual items.)

Reliance on a small number of major customers often selling under their own brand names gives certain advantages to suppliers in economies of long production runs, elimination of marketing and administrative overheads. Some alleged disadvantages have been discussed both with textile producers and with large multiple retailers:-

(1) Some producers alleged that certain retailers are relying increasingly upon imports for the "base load" of their requirements of garments or fabrics. The majority of garments sold by the largest retailers consulted during this study appear to be made up in this country but policies on importation of cloth differ widely. There seems to be some consensus that savings in costs through use of imports are to some degree offset by difficulties of communication regarding qualities and composition (e.g. by colours) of fabrics supplied.

Some retailers have decided to buy in the United Kingdom as a matter of long term policy, others buy overseas if cost savings are significant and if the volume is sufficient to cover costs of communication with overseas suppliers. Such communication is least important in the case of less expensive products in regular demand and not subject to fashion changes (e.g. working clothes and children's playclothes). Some retailers who currently import much of their fabric expressed the view that imports are likely to represent a progressively lower proportion of cloth and garment consumption because of the devaluation of sterling, high rates of inflation in certain Far Eastern countries and the reductions in costs now (1975) being achieved in the U.K. textiles industry. The impact of quotas and implications of existing and potential import restrictions for reliability of supply are additional influences. Opposite factors include availability of cheaper fibres enjoyed by some Far Eastern producers (including polyester fibres exported at marginal cost prices by U.S. and European producers) and increasing willingness on the part of U.K. garment producers, including some within textile groups, to find overseas supplies of fabrics. This is examined again in Section V.

(2) There was almost universal concern among manufacturers about the downward pressure on prices of knitted garments, fabrics and yarns imposed by the large customers. A number of producers agreed with the retailers' own argument that this pressure reflected competition between retailers. Those retailers with a "buy British" policy were competing with other large retailers and with independent shops where imported garments have their main outlet. One textile manufacturer bemoaned the fact that his cost reductions were passed on to the ultimate consumer, on the grounds that this threatened the long-term stability of the industry.

(3) The policy on the part of retailers of holding minimum stock levels (warehousing is not common practice), together with the horizontal structure of much of the textile industry and consequent extension of the production period, leads to sharp variations in orders received by producers in the earlier stages of textile processing. This situation is aggravated by what the manufacturers see as deferred acceptance of agreed orders and resulting deferment of

payment. Among the large retailers consulted during the study there seemed to be some recognition of the problems which their low-inventory policy created for suppliers. (This recognition was confirmed by the suppliers themselves.) Assistance with cash flow difficulties, placing of alternative orders for immediate delivery and payment for garments and cloth ordered but not yet accepted were among policies adopted by different firms. One major retailer explained that there is a conflict of interests:- the manufacturer would like a definite order well in advance of a firm delivery date after which payment would be prompt; the retailer, especially in this fashion-influenced trade, wishes to maintain maximum flexibility. The need to establish good communications with suppliers provides some pressure towards loyalty on the part of the large retailers and towards a compromise between these conflicting objectives.

Investment in the share capital of suppliers remains exceptional and appears to be confined to only one of the large retail groups. Although the comments of both manufacturers and retailers showed that trade between them was affected by longer-term considerations, there is little doubt that the dominance of large retailers has motivated some of the changes in the structure of the textile industry since the early 1960's. When well over half of the output of a textile firm goes to one customer with whom there is no financial or other tie and when those goods represent as little as 5 per cent of the customer's supplies, bargaining must be uneven. (One large retailer insists that its purchases must not account for more than one-third of any suppliers output of the product concerned. to avoid "moral constraints" on freedom to place subsequent orders. Another firm aims to make suppliers significantly but not excessively dependent. Some dependence is regarded as necessary to ensure supplies during periods of boom, when other orders may become more profitable than contracts with retailers.)

One of the policies adopted by some large textile firms to counter the power of multiple chain-stores has been the sale of branded apparel and household textiles. The practical difficulties of developing brands while at the same time supplying similar items for sale under the retailers' labels are discussed at greater length in the comments on product groups in Section V. Important preconditions for branding are size (to achieve economies of marketing) and vertical integration (to ensure quality). Increased size and vertical integration are also important in the creation of countervailing selling power to offset reliance on large customers.

D. THE ROLE OF THE LARGE FIBRE PRODUCERS

By 1960, the production of man-made fibres in the United Kingdom was dominated by Courtaulds and I.C.I. Courtaulds was (and remains) the dominant producer of cellulosic fibres (rayon and acetate), while I.C.I. was developing polyesters as well as producing nylon in a joint venture with Courtaulds. Courtaulds was also developing acrylic fibres.

An abortive attempt by I.C.I. to take over Courtaulds in 1961-2 (described in Appendix F), led to the exchange of I.C.I.'s holding of Courtaulds' equity plus £10m. for Courtaulds' 50 per cent interest in the joint nylon subsidiary (British Nylon Spinners Ltd.) in 1964. Since that date Courtaulds has developed its own nylon production and are currently increasing output of polyesters. Approximate shares of U.K. production of major fibres in 1972 were as follows:-

		Courtaulds	I.C.I.	Others
Cellulosic	Rayon	100	-	-
	Acetate	80	-	20
Synthetics	Nylon	20	60	20
	Polyester	5	80	15
	Acrylics	60	-	40

The strong position of Courtaulds and I.C.I. in the U.K. market for man-made fibres could prove irrelevant if the textile industries which used those fibres were to go on contracting as a result of declining exports and increased penetration of the U.K. market by imports. The cotton industry in particular appeared very vulnerable. Fragmented, horizontally organised, having failed to take full advantage of assistance with re-equipment, the Lancashire industry faced large customers who could buy their textile fabrics at lower cost overseas.

This fear for the future of their market in Lancashire motivated both Courtaulds and I.C.I. to invest large sums of money into the spinning, weaving and knitting industries. Courtaulds' chairman explained his own company's policy in his statement to shareholders in 1965: "We wanted to ensure that there would indeed be a Lancashire industry to take our

The two companies acted differently in the way in which they intervened in the textile industry. Courtaulds, with long experience in silk and filament weaving, embarked upon a policy of acquisitions in the "cotton" spinning and weaving and hosiery industries: I.C.I. pursued a policy of long-term lending and purchases of limited amounts of share capital; their major acquisition (Carrington-Viyella Ltd.) was the result of short-term necessity not long-term design.

Over the period 1963-9 Courtaulds spent nearly £150m. on acquisitions leaving it with 30 per cent of all Lancashire spinning production, 22 per cent of filament weaving, 35 per cent of warp-knitting and 35 per cent of ladies' hosiery. (For further details see Appendix F). In addition, the firm invested £5m. in English Sewing Cotton Ltd. and as a result held 8 per cent of the equity of English Calico Ltd., which in 1968 was its largest competitor in Lancashire. (An investment in Carrington and Dewhurst Ltd. was sold to I.C.I. in 1968).

I.C.I. also invested money in English Sewing Cotton Ltd. (leaving it with 8 per cent of the equity of English Calico) and over the period 1963-70 invested over £20 millions in Viyella International Ltd. and Carrington and Dewhurst Ltd. When these firms experienced financial difficulties in 1970, I.C.I. arranged a merger and with further investment into the new company (Carrington-Viyella Ltd.) possessed 64 per cent of the equity. In the woollen industry during the 1960's I.C.I. acquired a 20% holding in Lister and Co. Ltd. a worsted combine with net assets of £14 millions and a 1968 turnover of £27 millions.

Following the report of the Monopolies Commission into the supply of cellulosic fibres (1968), the Government adopted a policy of active discouragement of further acquisitions by fibre producers of textile firms. I.C.I. agreed to reduce its holding of shares in Carrington-Viyella Ltd. to 35 per cent of the equity "as soon as possible" (no significant disposal had occurred by mid-1975) and meanwhile to exercise voting power equivalent to only 35 per cent. The Government's policy also prevented the execution of a bid for English Calico Ltd. which Courtaulds announced in 1969.

As a result of Government policy, fibre manufacturers did not extend their participation in textile procesing between 1969 and 1973. Since most of the previous increase in concentration had been due to intervention by fibre manufacturers, this slowed down markedly the process of concentration in the cotton and hosiery sectors. In the woollen sector, fibre manufacturers have acquired less financial interest, possibly because they felt that this sector was less vulnerable to imports and was more certain to remain as a major outlet for the next few years.

Since 1973 Courtaulds Ltd. has acquired a 29 per cent holding in Highams Ltd. a vertically integrated manufacturer of cotton-type textiles especially sheets and bedding, with a 1973 turnover of £14m. This will provide Courtaulds with an outlet for polyester/cotton yarns which were developed at an earlier stage by Carrington-Viyella in collaboration with I.C.I. Government policy on such acquisitions has not changed: in June 1975 Courtaulds agreed with the Office of Fair Trading to reduce the holding to 25% and not to use it to influence policy.

Discussions with textile companies suggest that most of Courtaulds' output of synthetic fibres is used by its own subsidiaries in spinning, weaving, hosiery and knitting. Cellulosic fibres are sold by Courtaulds to its own subsidiaries and their competitors and this leads to occasional friction on transfer-pricing in times of recession and on maintenance of supply in times of boom. Friction has also occurred when major retailers have placed orders with Courtaulds' subsidiaries for commission weaving or making up from yarns or fabrics bought outside the Courtaulds' group and including competitive fibres. In spite of these allegations, the general view which appeared to emerge from discussions within the industry was that Courtaulds' more widespread participation in textile processing provides it with greater facility for production planning and control over deliveries than I.C.I.

E. GOVERNMENT POLICY

Although a negative attitude towards participation by fibre manufacturers in textile processing has been adopted since 1969, governments (of both

parties) have otherwise tended to favour amalgamations within the industry. This policy was, to some extent, implicit in the Cotton Industry Act 1959. Discussions with smaller firms within the industry revealed that the Department of Industry (or its earlier equivalents) has in recent years arranged a number of mergers with a view to elimination of excess capacity in small firms, re-equipment and reorganisation.

For the woollen and worsted industry, less affected by intervention on the part of fibre manufacturers than either the cotton or knitwear sub-sectors, the Government introduced in July 1973 the first assistance scheme under the 1972 Industry Act. The aims of this are "rationalisation of production facilities, improvement of structure and elimination of uneconomic and un-needed capacity". (7) There are three forms of assistance:-

(1) Capital grants for re-equipment: 15 per cent of total costs for plant and machinery within existing buildings and 20 percent of total costs for combinations of plant and new buildings. (In both cases the proportions refer to costs after deduction of any regional development grants).

(2) "Realisation grants" for companies ceasing to trade or closing down complete factories. These grants may be calculated either as 4 per cent of annual turnover or on the basis of standard payments per spindle or loom eliminated.

(3) "Ad hoc finance" (loans or interest relief) for schemes of rationalisation or amalgamation.

By the end of 1974 applications had been received for £6.5 m. in capital grants (relating to gross expenditure of £27m. on equipment and £9m. on buildings) and for £0.3m. for "realisation payments" (equivalent to the closure of capacity with an annual turnover of £7.5m.). No applications had been received for financial assistance with schemes of rationalisation or amalgamation and this was attributed by the regional director of the Department of Industry to the fact that financial assistance was "not sufficiently generous" to encourage such changes.

SECTION IV

A STATISTICAL STUDY OF CONCENTRATION 1963-73

A. METHODOLOGY

1. Concentration and Market Forces

In this study, as throughout the series published by the Commission, concentration measurement is applied to industries delineated by raw materials and methods of production. In the earlier Cranfield report about concentration in the paper industry doubt was expressed about the relationship between such measures and market competition. Power over a market depends primarily upon the inability of customers to turn to substitute products. The manufacturer of paper bags is competing more directly with producers of plastic bags than with manufacturers of paper napkins. Because of these reservations, much of the analysis was directed towards product groups within paper manufacture and conversion.

The traditional structure of the textile industries was less specialised. Distinct product groups existed but these were divided by technical rather than end-use boundaries:- fine and coarse yarns, woollen and worsted yarns, plain and fancy fabrics, fibre-, yarn- and piece-dyeing etc. The development of vertically integrated groups and branded goods has, to some degree, limited the flexibility of a producer to enter any market for which he is technically equipped but commission processing remains important.

In textiles as a whole there are fewer elements of competition from outside the industry than in the case of paper. For certain textile products there are close non-textile substitutes but these are exceptional. Competition between sub-sectors is close for certain end-uses:- warp-knitted and woven fabrics for many purposes, (for example bed-linen and shirts); between weft-knitted and woven fabrics, (for example dress fabrics, soft furnishings); and between fabrics produced on the woollen or worsted systems and those produced by "cotton" weavers or knitters, (for example woven worsted, woven cotton/synthetic mixtures and knitted fabrics for trousers). Some specialist activities can be clearly separated from the rest of the industry (for example ladies' hosiery and finished sewing

thread) though the trends towards amalgamation and vertical integration in recent years have resulted in the predominance in these specialist areas of firms strongly represented in the rest of the industry.

For these reasons, concentration indices give a closer indication of market structure in the textile industries than in paper but the analysis is probably more meaningful when the three sub-sectors are combined than when they are treated separately.

2. Coverage and Data

The terms of reference called for an examination of concentration in three sub-sectors: wool (NICE 231), cotton (NICE 233), hosiery and other knitted goods (NICE 237). The definitions in NICE (Nomenclature Industrielle de la Communauté Européenne) are very similar to those of the U.K. Standard Industrial Classification (flax is now of minor importance):

NICE 233	MLH 412	Spinning and doubling on the cotton or flax systems
	MLH 413	Weaving of cotton, linen and man-made fibres
NICE 231	MLH 414	Woollen and worsted
NICE 237	MLH 417	Hosiery and other knitted goods

The Standard Industrial Classification was therefore used since establishments were classified on this basis by the Business Statistics Office.

Firms in each sector were identified by the 1968 Census Directory of Businesses, by trade directories and by reference to trade associations. Ownership of subsidiaries was checked by reference to "Who Owns Whom" and by direct examination of "annual returns of members".

(a) Enterprise Data

Because the larger textile companies were engaged in at least two of the three sub-sectors, in some cases with other activities also, it was not possible to produce data for all variables for each firm in

each sub-sector. It was decided by the Commission that enterprise data should be confined to published consolidated accounts (from which inter-subsidiary transactions are excluded). A firm would be included in the enterprise analysis if its world-wide sales in the three sub-sectors accounted for more than 50 per cent of total sales. This created one very large anomaly - the exclusion of Courtaulds Ltd. whose fibre-producing and non-textile activities exceed activities in spinning, weaving and knitting. In certain cases (for example William Baird Textiles Ltd. and Smith and Nephew Textiles Ltd.) where separate consolidated accounts are published which summarise textile activities, these were included in the enterprise analysis. The enterprise tables can therefore be used only for comparison of the concentration of the variables; the total figures do not represent the total of the industries concerned but only of the sample.

The criteria for inclusion in the enterprise sample were a turnover of at least £3 millions in the three sectors combined. The expansion of the sample, from 49 firms in 1968 to 55 in 1973 was due to inflation and amalgamations of smaller firms on the one hand, only partly offset by liquidations on the other.

Variables included in the enterprise analysis were:-

(E.E.C. Code)	01	Turnover
	04	Net Profit before Tax
	05	Cash Flow: 04 + depreciation
	06	Gross Investment (additions to fixed assets)
	07	Equity (shareholders' funds)
	08	Exports from the U.K.
(Additional Codes)	10	Net Assets = total assets - current liabilities
	11	Net Cash Flow = Cash Flow - Taxes

Concentration indices can meaningfully be applied only to positive values. In accordance with analytical principles specified by the Commission, firms making losses or experiencing negative cash flows (variables 04, 05 and 12) are omitted from the analysis of the variable concerned. This explains the discrepancies in the Tables of Concentration at the end of this report between the numbers of firms occurring in tabulations of different variables in the same year. For some purposes, the author has thought it desirable to analyse net profits before tax and losses; when

described in this report, the variable concerned is referred to as "net results" and a brief definition is repeated,in order to avoid confusion.

The level of price inflation experienced in the United Kingdom in recent years significantly disturts inter-company comparison of long-term capital. Negligible differences in the ages of fixed assets lead to substantial differences in the book value of assets (e.g. a new factory built in 1970 might have cost 40 per cent less than an identical one built in 1973). Periodic revaluations of assets may also affect capital values. The variables affected by this factor are 07 (equity), 10 (net assets) and, because of the effect on depreciation, 04 (net profit before tax).

Figures relate to those accounting periods which most closely correspond to the calendar year. For example "1968" data are taken from accounts for financial years ending any time from July 1968 to June 1969. In practice, all of the larger companies were found to report within the period October to March, most of them at the end of the calendar year.

Employment and wages bill were omitted from the analysis because most firms published data only for their U.K. operations and these could not be compared with world-wide values for other variables.

(b) Economic Activity Units

The figures used in the analysis of "economic activity units" are estimates of turnover of U.K. operations in each of the three sub-sectors and of their contributions to group profits (where a firm is engaged entirely in the U.K. and in sub-sector concerned the enterprise and economic activity unit figures will coincide). When the available breakdown of profits for diversified enterprises related to profits before interest or before central expenses, the author adjusted the figures by allocating these deductions in proportion to sales turnover. (This adjustment is necessary for comparison with other single-activity firms and for consistency with the Commission's definitions). Losses were again excluded from the analysis.

In most cases it was possible to obtain data for diversified firms on turnover and profits in each sub-sector. Some firms published the requisite breakdown in their consolidated accounts; in other cases it was possible to obtain the data by analysis of subsidiaries (with guidance from some of the firms concerned). In a few cases where published data were not available estimates were made from a wide variety of sources, including publications of other researchers (see the Bibliography).

Economic activity unit data were assembled for each of the three sub-sectors and also for the combination of the three. In the combined figures, vertically integrated finishing and making-up activities were included. The advantage of their inclusion was ability to use published rather than estimated data for all but one firm; it also avoided arbitrary assumptions about transfer pricing.

The samples of firms for inclusion in the economic activity unit tables for sub-sectors were based on two criteria:

(a) Turnover of at least £1 million in the sub-sector concerned

(b) Where the number of such firms exceeded 60, the first 60 in terms of turnover were included. (In 1970 for wool the sample was extended to 61 because of a discrete gap in the distribution of sales turnover after the 61st firm.)

The economic activity unit tables for combined activities ("textiles") relate to firms with turnover of at least £3 million in one or more of the three sub-sectors and vertically integrated finishing and making-up activities.

Appendix A shows a list of firms included in enterprise and economic activity unit tables for combined activities in 1968 and 1973. This listing shows turnover in all activities, and in textiles, world-wide and in the United Kingdom.

3. Definitions and Basic Properties of Concentration Indices

In this explanation of the main indices specified by the Commission and used in this analysis the following notation is used:

N total number of firms in the industry;

x_i the value of a variable for Firm i, when firms are ranked in descending order with respect to that variable;

X the aggregate of the variable for the whole industry, that is,

$$\sum_{i=1}^{N} x_i$$

P_i the proportion of the aggregate accounted for by Firm i, that is,

$$\frac{x_i}{X}$$

μ the arithmetic mean value of the variable, that is, $\frac{X}{N}$

(a) Concentration Ratio

The concentration ratio for R firms within an industry is the fraction of the total value of the variable accounted for by the R largest firms ranked in descending order of that variable:-

$$CR_{(\%)} = \frac{100}{X} \sum_{i=1}^{R} x_i$$

Concentration ratios give only limited information about the structure of an industry. With different distributions of the variable, comparison of degrees of concentration between different sectors may depend on the number of firms chosen. In industry A the top five firms may account for 40 per cent of sales and the next five 30 per cent (giving a ten-firm CR of 70 per cent). In industry B the five largest firms may account for 50 per cent of sales and the next five 18 per cent (giving a ten-firm CR of 68 per cent).

(b) Coefficient of Variation

This is the standard deviation of the distribution of values of the variable as a proportion of the mean

$$V = \frac{1}{\mu}\sqrt{\frac{\Sigma(x_i-\mu)^2}{N-1}}$$

(c) The Gini Coefficient

This measure is based on the Lorenz curve. The Lorenz curve plots the percentage of total industry turnover on the vertical axis against percentage of firms cumulated from the smallest on the horizontal axis. Thus the curve is concave (degenerating into a straight line when all firms are of equal size). Where a variable other than turnover is used, the percentage of firms is cumulated from the firm with the smallest value of the variable under consideration.

The Gini Coefficient is defined (see Fig. 1) as:

$$\frac{Shaded\ Area}{Area\ OXY}$$

It ranges from 0 (all firms equal in size) to 1 (all output in the hands of a single firm). The following formula provides a method of calculation when the values of the variable are ranked in ascending order $(x_j;\ j+1 \text{ to } N)$

$$\frac{1}{NX} \sum_{j=1}^{N} (j-1)F_j - jF_{j-1}$$

$$F_j = \sum_{k=N-j+1}^{N} x_k$$

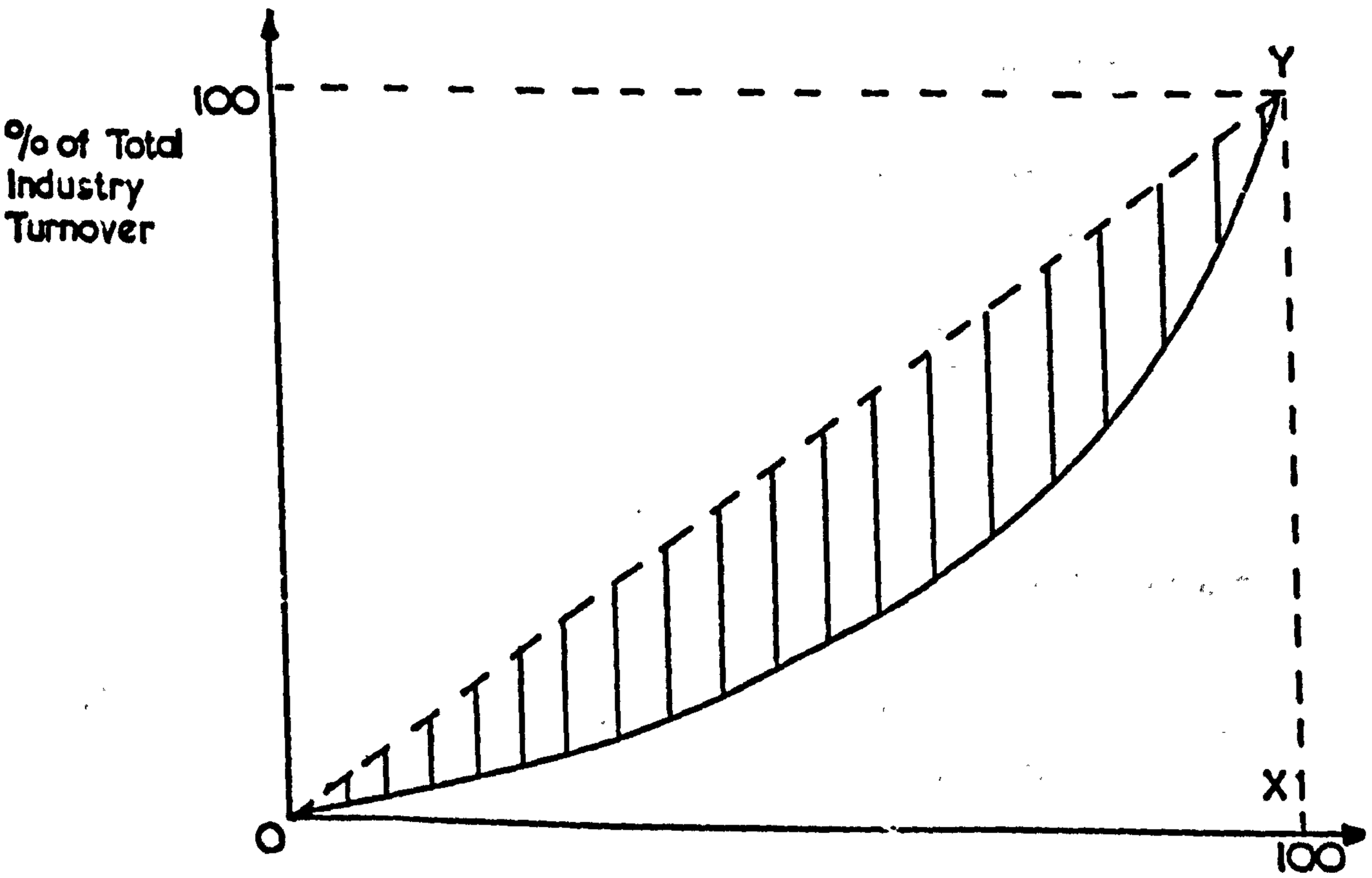

Fig. 1

(d) Herfindahl-Hirschmann Index

This was suggested by Herfindahl and is defined as the sum of the squares of the market shares, i.e.

$$\text{Herfindahl-Hirschmann Index} = \sum_{i=1}^{N} p_i^2$$

The index lies between $\frac{1}{N}$ and 1. Some authors prefer to define it as:

$$\text{H-H} = 1000 \sum_{i=1}^{N} p_i^2$$

i.e. to inflate its value by a multiple of 1000. This convention has been adopted by the Commission and is followed in this report.

The index is related to the coefficient of variation and in other publications by the Commission in this series has been defined accordingly:-

$$\text{H-H} = \frac{1000(V^2 + 1)}{N}$$

(e) Entropy

This is defined as:-

$$\text{Entropy Index, } E = -\sum_{i=1}^{N} p_i \log p_i$$

If one share is 1 and all others are 0, then $E = 0$ and the degree of concentration is maximum. If all shares are equal $(=\frac{1}{N})$ tnen $E = -\log N$ and the degree of concentration is minimum for that value of N.

The entropy index, explained at some length in the Cranfield report on the paper industry, has the advantage over other measures of concentration that absolute changes in its value may be compared. For example if the Gini coefficient moves from 0.3 to 0.5 in one industry and from 0.7 to 0.9 in another, it cannot be concluded that concentration has increased to the same degree. With the entropy index, such a conclusion could be drawn. (10)

(f) Linda Index

Another measure of industrial concentration is given by Linda.

$$Q_i = \frac{K - i}{i} \cdot \frac{A_i}{1 - A_i}$$

where $A_i = \frac{1}{X} \sum_{j=1}^{i} x_j$ and values of x are in descending order.

K may be any number of firms from 2 to N. (Thus Q_i is the average share of the market held by the top i firms divided by the average share of the market held by the other $(K-i)$ firms included in the sample).

The Linda Index is defined as:

$$\frac{1}{K(K-1)} = \sum_{1}^{K-1} Q_i$$

(i.e. the Linda Index is $\frac{1}{K}$ x the average of the Q_i s).

The Linda index is designed to measure the degree of inequality between the values of the variable included in a sub-sample of K units.

The Linda Index may also be used to define the boundary between oligopolists within an industry and the other firms. This boundary occurs when the value of $\frac{x_k}{x_{k+1}}$ is so large in relation to previous ratios that, in spite of

averaging, the Linda index rises. If the value of the Linda index (L) is greater for ($k+1$) than for (k) then an "oligopolistic arena" of k firms may be identified.

Mathematically this critical point (k_m) may be defined as where

$$\frac{dL}{dk} = 0 \quad \text{and} \quad \frac{d^2L}{dk^2} > 0$$

A measure of "synthesis" (LS) is included in the Tables of Concentration. This represents the mean value of the Linda indices from $k=2$ to$k=k_m$. LS is used in further statistical development of the analysis of concentration now being undertaken by the Commission.

The definition of k_m (N^*_m in the Tables of Concentration) on this basis differs from that used in earlier reports published by the Commission. This re-definition follows further analysis of the concepts underlying the Linda approach.

B. CHANGES IN CONCENTRATION 1963-8

Section III of this report outlined the influences towards greater concentration during this period and emphasised the importance of the two main fibre producers in the formation of vertically integrated combines in the "cotton" and knitwear sectors. Because of government discouragement of further intervention of this kind, the structure of these sub-sectors has changed much less since 1968 and an examination of the earlier evolution is necessary for an understanding of this more recent period of consolidation. Appendix Tables B (1 to 5) show a breakdown of economic activity units by size of employment according

to the 1968 Census. The most convenient method of summary comparison is use of Gini coefficients, based not on individual enterprises but on the groupings shown in the appendices. Reference will also be made to five-firm concentration ratios, which have already been described in Section II.

Table (18) shows the Gini coefficients for the three sub-sectors (cotton spinning and weaving are shown separately) and compares these with corresponding figures for textiles as a whole (including sub-sectors outside the present study) and for all manufacturing.

These coefficients show that for all three variables the degree of concentration in textiles was less than in manufacturing as a whole. There was, however, a much greater increase in concentration in textiles between 1963 and 1968 than that which occurred in total manufacturing.

Although, because classification was based on employment, the degree of concentration of the other two variables might be understated,[1] the Gini coefficients for both manufacturing and textiles are least for employment and greatest for capital expenditure. Net output was more concentrated than employment because larger firms produced greater net output per employee; this is almost certainly due to a higher capital : labour ratio. Because concentration was the greatest in capital expenditure, it appears that the relationship between size and labour productivity may have become stronger since 1968.

In textiles in 1968 the six firms with 10,000 or more employees accounted for over 42% of investment by all of the 1,871 firms employing 25 or more. The 96 largest employers were responsible for 46 per cent of employment and nearly 60 per cent of investment. Between 1963 and 1968 the concentration of capital expenditure increased substantially in textiles, whereas in all manufacturing no such tendency was apparent.

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[1] This would occur if the ranking by employment were substantially different from that of the other variables. Because of the large numbers and the broad size categories, such distortion is probably slight.

TABLE 18: TABLE OF GINI COEFFICIENTS

	Employment		Net Output		Capital Expenditure	
	1963	1968	1963	1968	1963	1968
Cotton, flax, and man-made fibres - spinning	0.674	0.696	0.659	0.715	0.734	0.740
Cotton, flax, and man-made fibres - weaving	0.544	0.573	0.578	0.603	0.728	0.788
Woollen and worsted	0.616	0.634	0.622	0.650	0.703	0.655
Hosiery and Knitwear	0.650	0.698	0.644	0.706	0.654	0.740
All textile activities	0.691	0.733	0.726	0.777	0.754	0.822
All manufacturing industries	0.784	0.802	0.818	0.832	0.856	0.850

Concentration in each of the four sub-sectors currently being studied was less than in textiles as a whole. There are a number of reasons for this:-

1. Certain other sub-sectors of the textile industry are much more highly concentrated. These include the production of man-made fibres (MLH 411), which accounted for 15 per cent of net output and in which there were only five firms in 1968 and textile finishing (MLH 419), which is also dominated by large combines.

2. Analysis by sub-sectors ignores the existence of vertically integrated "textile conglomerates" with substantial interests in most sub-sectors but without dominance in any single one.

3. Vertical integration is linked with size of firm in the cotton (and allied fibres) industry. By splitting this industry into spinning and weaving, the Census results understate the importance of large vertically integrated groups.

Points (2) and (3) need to be remembered in any interpretation of the Gini coefficients for the individual sectors.

Cotton (and allied fibres) spinning was in 1963 the most concentrated of the four sub-sectors, though by 1968 hosiery and knitwear had approached a similar degree of concentration. One unusual feature of this sub-sector in 1963 was the absence of a positive relationship between net output per employee and size of employment. This is probably explained by the importance of small specialist firms working on high-value yarns; concentration is greatest in the high volume, lower value coarser yarns. By 1968 the more usual relationship of labour productivity with size had become apparent in this sub-sector, almost certainly because of the application of more advanced spinning techniques by the larger firms.

The five-firm concentration ratios for single cotton or man-made fibre yarn increased from 37.2 per cent in 1963 to 50.3 per cent in 1968. In both years there was much greater concentration in the production of finished thread, which is dominated by four companies.

Cotton (and allied fibres) weaving remained, even in 1968, much less concentrated than other textile sectors. Because of a previous absence of comparable economies of scale, the weaving industry had until recent years a much more atomistic structure than that of spinning. However, continued separation of spinning and weaving in Government statistics leads to serious understatement of the predominance in these more recent years of vertically integrated concerns.

One indication of the growing importance of the largest firms in weaving is the high concentration of capital expenditure. In 1968, 55 per cent of all capital expenditure was undertaken by only four companies: the author knows that these were vertically integrated concerns with interests in other sectors of the textile industry.

Increased concentration in weaving is also reflected in the 5-firm concentration ratios which rose from 19.3 to 31.2 per cent for cotton cloth and from 35.8 to 51.9 per cent for man-made fibre cloth. Some of the largest weavers of synthetic fabrics were wholly or partly owned by Courtaulds and Imperial Chemicals Industries Ltd. Courtaulds and Carrington & Dewhurst produced over half of fabrics woven from filament yarns. (3)

The woollen and worsted industry showed comparatively little increase in concentration between 1963 and 1968. Very large firms were less dominant, in terms of net output and capital expenditure, than in any of the other three sub-sectors:

% of variable represented by enterprises with 2,000 or more workers in 1968

	Employment	Net Output	Investment
Woollen and worsted	29	28	27
Cotton etc. spinning	41	39	47
Cotton etc. weaving	28	29	57
Hosiery and knitwear	35	39	47

This confirms the conclusion of Section III that fibre manufacturers became much less involved in the woollen and worsted industries than in "cotton" and hosiery and knitting.

In hosiery and knitting the main increases in concentration occurred in the production of warp-knitted fabrics (for which separate data were not at the time published) and in hosiery proper (men's and women's), for which the five-firm concentration ratio increased from 20 to 43 per cent. Both of these sections of the industry were affected by major acquisitions by the fibre manufacturers themselves or firms with their financial support.

C. CONCENTRATION OF SALES TURNOVER 1968-73

The results of the statistical analysis of samples of company accounts are shown in Appendix B (Tables of Concentration). For technical reasons these were produced at Cranfield but the contents are identical to those of the Tableaux de Concentration produced by the Commission to accompany other reports in this series.

1. Concentration in the Sub-sectors as a whole

Because of the continued existence of a very large number of small firms, it was not possible to produce complete data on the residue of the industry not included in the samples. (In any sub-sector these comprise firms with turnover of at least £1 million, subject to a maximum of 60; in the combination of sub-sectors and in the enterprise analysis the turnover criterion is £3 millions).

Some evidence is available on sales turnover of establishments engaged principally in each sub-sector from data published by the Business Statistics Office (6). For the "cotton"sub-sector the separation of spinning and weaving in official statistics results in double-counting of yarn produced by vertically integrated enterprises when sales figures are added together.

The sample turnover figures include yarn sales to weavers, other than inter-group transactions; the use of input-output tables to produce "gross output free from duplication" for spinning and weaving combined

therefore led to a cotton industry total which was less than that of tne sample. Estimates of total sales to outside customers by establishments in the cotton sub-sector have been derived by the author but are less reliable than the totals for the wool and knitting sub-sectors, for which the B.S.O. publishes figures on this basis. These estimates are explained in Appendix C.

A delay in the publication of the enterprise tables for the 1970 and 1971 Censuses of Production restricts analysis to a comparison of sample totals for economic activity units with these data for establishments. The comparison is somewhat unsatisfactory, because of the existence of multi-activity establishments.

The following table shows approximate estimates of 30-firm concentration ratios in each of the sub-sectors, as well as the proportion of overall turnover represented by all firms in the samples:

TABLE 19: SHARES(%) OF OVERALL SUB-SECTOR TURNOVER

	Wool	Cotton	Hosiery and knitting
(a) Obtained by all firms in the samples			
1968	56	73	83
1969	58	74	82
1970	59	75	80
1971	65	77	87
1972	64	80	83
1973	60	82	90
(b) Obtained by 30 largest firms			
1968	48	68	75
1969	50	70	74
1970	50	71	72
1971	55	73	79
1972	55	76	75
1973	52	78	81

The table indicates that there was in each sub-sector a fall in the

estimated shares of total turnover being obtained by firms other than the top 30 in each sub-sector (in cotton from 32 to 22 per cent; in hosiery from 25 to 19 per cent and in wool from 52 to 48 per cent). Although these falls were moderate in view of the often-quoted economies of amalgamation and rationalisation, this comparison conceals reductions through mergers, takeovers, and cessation of trading, of the numbers of firms concerned. In the woollen and worsted sub-sector, the number of enterprises with at least 25 employees in 1968 was 538, by 1973 this number had fallen to 393. In hosiery and knitting the corresponding fall was from 548 to 370[1]. Comparable figures are not available for the cotton sub-sector.

2. Oligopoly

From the Concentration tables and from the graphical representations of the Linda curves at the end of them it will be seen that in each sub-sector there is in most years a minimum (i.e. a point preceded and followed by a higher value) in the Linda index for a small number of firms. This implies that a small group exists whose shares of the market are considerably greater than that of the next largest firm. The Linda index itself measures the average degree of inequality among this group ("within the oligopolistic arena").

The table overleaf, relating to turnover in 1968, demonstrates the meaning of this concept.

Although an"oligopoly" may be said to exist in a statistical sense, this does not mean that the U.K. market is dominated by the firms concerned. For example in the cotton sub-sector although the four largest firms accounted for 58 per cent of sales by U.K. manufacturers, imports supplied more than half (by weight) of all articles made from cotton and/or man-made fibres. This intensely competitive situation needs to be borne in mind throughout the reading of this section.

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1 Business Statistics Office data, with an adjustment by the author of the 1973 figure for knitting to overcome the official separation of warp knitting from the rest of the sub-sector.

	Wool	Cotton	Knitting
Number of firms in group	6	4	7
Combined share of total turnover in sample (%)	48.2	56.2	67.3
Share of the smallest in the group(%)	5.0	9.3	3.8
Share of the largest firm excluded(%)	3.6	3.6	2.4
Linda index for the group	0.245	0.464	0.912

The predominance of a few firms was greatest in the cotton sub-sector where four concerns (Courtaulds, Tootal, Viyella International and Carrington and Dewhurst) together accounted for 56 per cent of the turnover of the 52 firms in the sample. In the wool sector the "oligopolists" were six in number with 48 per cent of turnover but the lower value of the Linda coefficient shows that they were more equal in size than the four cotton companies. In hosiery and knitting the oligopoly was slightly larger but within the larger group there was greater inequality.

In most studies of concentration, oligopolistic groups are associated with specialisation. In their study of the paper industries the Cranfield research team found that no oligopoly situation was indicated by the Linda curves for paper manufacture and conversion but that specialist activities tended to be dominated by small groups. This led to some doubts about the validity of application of concentration measures to paper-making and -using activities as integral industries.

In textiles there is a different situation. When distinctions between "cotton", "wool" and knitting are ignored (man-made fibres predominate throughout!) a distinct <u>textile</u> oligopoly remains, consisting of multi-process firms.

In 1968 there were five companies which together controlled 57.3 per cent of the total of the 50 largest figures of U.K. turnover derived from spinning, weaving or knitting of wool, cotton or man-made fibres. These five were Courtaulds, English Calico (now Tootal), Coats-Paton, Viyella International and Carrington and Dewhurst. Courtaulds' turnover in textile processing in 1968, the end of its period of most extensive

acquisitions in cotton-type spinning and weaving and in hosiery was about £228 millions whereas those of the other groups ranged from £69 millions (Carrington & Dewhurst)to £78 millions (Tootal and Coats Paton). The largest firm excluded from the "oligopolistic arena" defined by Linda index was Illingworth Morris (U.K. textile turnover of £29 millions).

The amalgamation of Carrington & Dewhurst and Viyella International at the end of 1970 reduced the oligopoly to four members with 55 per cent of sample turnover and made Carrington-Viyella the second largest firm with a textile turnover in 1971 of £142 millions, just under half that of Courtaulds. By 1973, Illingworth Morris had increased its U.K. textile sales to £82 millions and had become part of the oligopoly group. The five firms concerned together controlled 55 per cent of turnover in the sample of 58 textile companies with over £3 million annual sales; the degree of concentration had, therefore, changed negligibly since 1968.

The representation of the large combines in each of the sub-sectors is shown in Table 20, which also names other competitors in the "oligopolistic arena" within each sub-sector:

TABLE 20: OLIGOPOLY GROUPS 1973

Sub-sector	Oligopolistic Arena		Names of firms (share of sample)	
	No. of Firms	Combined share of sample total (rounded)		
Wool	2	30	Illingworth Morris Coats Paton	(16) (14)
Cotton (1972)*	3	52	Courtaulds Carrington-Viyella Tootal (formerly English Calico)	(22) (19) (11)
Hosiery & Knitwear	8	68	Courtaulds Nottingham Manufacturing Coats Paton Carrington-Viyella Tootal Corah Pretty Polly Dawson International	(28) (9) (8) (7) (6) (4) (4) (3)

* The year 1973 saw exceptional boom conditions in the Lancashire industry and which had rationalised production less than the big three appear to have been better able to exploit this.

In the wool sector, although two firms were distinctly larger than their competitors it cannot be argued that there was a duopoly in 1973 because they together had only 30 per cent of total sample turnover. The position of the two firms results largely from acquisitions during the period covered by the survey. These acquisitions included firms which had been among the largest in the woollen textile industry.

In cotton the situation is probably closest to oligopoly, in spite of the tendency since 1971 for the predominant position of the big three to decline somewhat. It may be recalled that I.C.I. owns 64 per cent of the equity of Carrington-Viyella and eight per cent of Tootal (it has a nominee on the board of Tootal) and that Courtaulds (eight per cent) and Illingworth Morris (two per cent) have investments in Tootal. Part-acquisition by Courtaulds of Highams Ltd. will strengthen its share of the market, though its competitive advantage may be decreased by government surveillance.

In hosiery and other knitting, the statistical approach is somewhat misleading because of market segmentation. Thus, whereas Courtaulds produces warp-knitted and weft-knitted fabrics, knitted garments and hosiery, none of the other groups is represented in all of these activities. Pretty Polly, for example, is almost entirely engaged in ladies' hosiery.

3. Summary of Changes in Concentration of Turnover 1968-73

(a) Wool

The growth of the two largest firms in the wool sub-sector has already been described. This development resulted from acquisitions within the larger enterprises in the industry, so that the percentages of total turnover in the sample represented by the top 10, 20 and 30 firms changed little (see Table 21 below). The index of entropy rose from -151.7 to -146.8, a rise of 4.9 points,[1] indicating a greater increase in concentration in this sub-sector than in either of the other two.

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[1] This index is the only one of the series in the Tables of Concentration which permits comparison of absolute changes.

(b) Cotton

The main change in concentration in the cotton sector was the merging of Viyella International and Carrington & Dewhurst at the end of 1970. In 1970 (treating the two firms as separate), it is estimated that four firms accounted for 53 per cent of sample turnover; in 1971 the three firms accounted for a slightly greater percentage. Apart from this single merger, the structure of the cotton sub-sector changed little between 1968 and 1973, mainly because of Government hostility towards further extension by I.C.I. and Courtaulds. (Had the Government not intervened Courtaulds might well have acquired English Calico and this might in turn have led I.C.I. to acquire more processing capacity.) The index of entropy rose by only 4.4 points.

(c) Hosiery & Knitting

In the hosiery and knitting sub-sector overall changes in structure within the sample of the 60 largest firms were negligible with only one major merger: that between Carrington and Dewhurst and Viyella International. Concentration ratios changed very little and the entropy index fell by 2.8 points.

(d) Combination of sub-sectors (Economic Activity Units)

Among the firms with over £3 millions turnover in the three sub-sectors combined a slight fall in concentration is observed. This results merely from the entry into the sample of additional firms attaining £3 m. turnover. While this change is primarily of technical interest, it emphasises the absence during the survey period of any further growth of large textile groups established in the five years before 1968.

TABLE 21: CHANGES IN CONCENTRATION WITHIN SAMPLES 1968-73

Concentration Ratios		Wool	Cotton	Knitting	Combined
Four firms	1968	35.9	56.2	52.9	49.8
	1973	41.6	56.0	53.3	51.9
Ten Firms	1968	60.0	72.8	72.6	70.4
	1973	60.5	75.5	72.4	67.3
Twenty Firms	1968	75.4	86.5	84.0	83.4
	1973	76.8	88.9	82.9	80.6
Entropy Index Change 1968-73		+4.9	+4.4	-2.8	-4.3

D. CONCENTRATION OF OTHER FINANCIAL VARIABLES 1968-73

1. Net Profits and Net Results (Economic Activity Units)

This part of the study was restricted by the existence in the industry of overseas and/or non-textile interests which are consolidated in the accounts of major textile companies. Comparison of net profit after interest and before tax with turnover for activity units is of doubtful validity for the following reasons:

(i) Turnover includes the value of purchased materials. A very efficient single-process firm may make a lower margin on sales than a less efficient vertically integrated firm.

(ii) Profits before interest may be more relevant, since the comparison with sales would then be less distorted by variations in the capital structure of the firms concerned.

(iii) For economic activity units, transfer pricing based on "group net benefit" may be reflected in misleading profit figures for any part of the vertical process. For example attention has been drawn by other researchers to low profit margins obtained by Courtaulds in its spinning and weaving activities (8) during the recession of 1970 but this policy has to be considered in relation to capacity utilisation in the company's fibre producing divisions.

(iv) The published data often reflect exceptional items or changes in accounting policy for which detailed adjustments are impossible in a large study of this kind. (Nearly 2,000 annual company reports have been examined).

(v) The depreciation estimates used in the calculation of net profit figures published by companies are based on historic cost of assets. In an inflationary period, comparison of net profit figures can be severely distorted by slight differences in the ages of fixed assets of different companies.

(vi) In some cases the research team has had to make its own estimates of profits derived by companies from particular activities or to use estimates of previous analysts. Such estimates must be regarded, at best, as approximate.

Concentration of net results has been examined in two ways:

(a) application of the statistical framework of the Commission to <u>positive values</u> (net profits), these being ranked independently of turnover, so that a four-firm concentration ratio (for example) would be the proportion of the total of all net profits in the sub-sector accounted for by the four firms with the largest profits;

(b) calculation of the shares of total net results (profits and losses

included) in the sub-sector achieved by specified numbers of "largest firms" ranked in order of sales turnover.

Approach (a) gives greater opportunity for more advanced statistical analysis but resulting coefficients cannot be validly compared with those for turnover if the ranking of the two variables is substantially different. Differences in ranking were found to be too great to justify general comparison of the two sets of results though partial comparison was possible (see below)[1].

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1 Ranking was checked by computation of product-moment correlation coefficients ($r_{log.T\ log\ \pi}$) and by rank correlation coefficients. The former were preferred because of the effects on ranking of minor differences between approximate estimates, which did not distort the correlation between logarithms of turnover (T) and profits (π). The resulting coefficients are shown at the end of Appendix D. Firms experiencing a loss were excluded from the calculation.

(a) Concentration indices for Net Profits (EAU)

The details contained in the Tables of Concentration are summarised in Table 22. The entropy index is again quoted so that absolute changes may be compared.

TABLE 22 : CONCENTRATION OF NET PROFITS (EAU) 1968-73

	1968	1969	1970	1971	1972	1973
Wool						
C.R. for 4 firms (%)	41	46	36	35	42	45
10	60	60	61	61	66	66
20	81	85	84	82	81	82
Gini Coefficient	0.56	0.58	0.57	0.58	0.59	0.59
Entropy index	-152	-147	-149	-149	-146	-147
Average profits as % of sales	5.2	3.9	2.7	3.4	6.4	7.0
Cotton						
C.R. for 4 firms (%)	67	57	55	59	58	58
10	82	77	78	84	83	81
20	92	91	92	96	94	93
Gini Coefficient	0.76	0.71	0.71	0.75	0.74	0.72
Entropy index	-115	-124	-122	-115	-118	-120
Average profits as % of sales	5.6	4.8	4.4	4.2	5.3	6.4
Hosiery and Knitting						
C.R. for 4 firms (%)	53	58	63	60	56	57
10	75	76	77	75	71	73
20	87	88	88	87	85	86
Gini Coefficient	0.71	0.73	0.73	0.71	0.69	0.71
Entropy index	-130	-124	-117	-123	-128	-127
Average profits as % of sales	7.0	5.9	5.3	6.3	6.8	7.6
Combined sub-sectors						
C.R. for 4 firms (%)	48	45	53	50	44	45
10	74	68	69	68	67	69
20	86	83	84	84	82	83
Gini coefficient	0.65	0.63	0.64	0.64	0.62	0.66
Entropy index	-131	-137	-131	-134	-139	-139
Average profits as % of sales	6.2	5.1	3.9	4.9	6.6	7.6

One of the more remarkable aspects of the concentration of profits in the cotton and wool sub-sectors is that during the recession years of 1969 and 1970, when average margins on sales fell sharply, profits became less concentrated. Because of the greater strength of large firms in relation to the market, an opposite tendency might be expected and can be seen to have occurred in the hosiery sub-sector. The reasons for this are discussed at greater length in Section V. They mainly reflect the pricing policies of certain of the larger vertically integrated companies which, because of the predominance of their fixed costs, were induced by the market into "weak selling".

It is evident from the table that profits were more concentrated in the cotton and knitting sub-sectors than in wool and this is consistent with the greater concentration of turnover in these two sectors.

(b) Relationship between Net Results and Turnover

Table 23 shows the results (net profits + net losses) of firms ranked in order of turnover as percentages of the total sum of net profits and losses in each sub-sector.

TABLE 23 : PERCENTAGES OF SAMPLE TURNOVER AND NET RESULTS HELD BY 5 AND 10 LARGEST FIRMS IN TERMS OF TURNOVER

	WOOL		COTTON		KNITTING		COMBINATION	
	Turn-Over	Net Result	Turn-Over	Net Result	Turn-Over	Net Result	Turn-Over	Net Result
1968 Top 5	43	62	60	68	58	57	57	55
10	60	62	73	77	73	74	70	71
1969 Top 5	47	47	59	57	58	62	56	47
10	62	63	73	72	73	75	68	65
1970 Top 5	44	35	57	57	58	71	54	42
10	61	62	69	69	72	73	66	62
1971 Top 5	46	32	61	60	60	62	58	48
10	61	50	77	82	73	73	69	64
1972 Top 5	47	47	61	60	58	56	57	47
10	61	60	76	81	72	68	68	65
1973 Top 5	46	49	60	61	58	57	56	54
10	61	60	76	79	71	68	67	66

This table shows that the comparative profitability of larger firms varied considerably between sub-sectors and over time. In wool the larger companies obtained shares of industry profits fairly close to their shares of turnover with the exception of the largest groups in 1970 and 1971, which (as was remarked earlier) reduced profit margins during a period of trade recession.

In cotton before the 1969-71 recession the very largest firms achieved a disproportionate share of profits and the effect of the recession was to reduce this share to approximate equality with their share of turnover. In the recovery some evidence of greater profitability is again indicated and this is believed (on the basis of discussions within the industry) to reflect increased margins.

In knitting, the effect of recession was to give a greater share of

the reduced profits to the five largest firms in terms of turnover: this was particularly pronounced in 1970. At other times, shares of trading results and turnover were approximately equal.

When combined textile processing interests are considered, the overall share of profits achieved by the largest firms was consistently below their share of turnover. Reasons for this lower profitability are examined in Section VI.

The great variations between profit margins between firms can lead to misleading conclusions when groups of five are considered. To avoid all problems of grouping a regression analysis was carried out on individual company data to test whether profit margins varied with sales turnover. In no sub-sector and in no year did any significant correlation exist: this means that the features observed in Table 22 were the result of performance by individual companies. Over the whole sample profit margins were not influenced by size of turnover. This is not surprising in view of the comments on page 63 and is consistent with the findings of most other research studies.

(c) Turnover and Profits in Oligopoly Groups

The Linda index can be used to identify groups of firms whose shares of profits are so high in relation to the rest of the samples that they may be defined as a major profit group analogous to an oligopoly. If profits were closely related to turnover as a constant or increasing function, then this select group of profit-makers would also be the oligopolists.

The oligopoly and major profit groups were found to coincide only in the case of the cotton sub-sector in 1968 and 1969. In 1968, the same four firms accounted for 56 per cent of sample turnover and 67 per cent of profits; in 1969 the corresponding proportions were 55 and 57 per cent. For the four, the Linda index was greater for

turnover than for profits indicating less inequality of profits than of turnover. The rankings of the four firms differed for the two variables. (ABCD for turnover in 1968; BCDA for profits.)

In all other instances, the oligopoly groups defined by the application of Linda coefficients to turnover did not coincide with distinct profit groups. Table 24 shows the shares of total net results (profits - losses) in each sub-sector and in textile processing as a whole annually from 1968 to 1973:

TABLE 24: SHARES OF TURNOVER AND PROFITS (NET RESULTS) OBTAINED BY OLIGOPOLY GROUPS

	1968	1969	1970	1971	1972	1973
Wool						
Number of firms	6	12	14	58	2	2
% share of sample turnover	48	*	*	*	31	30
% share of sample net results	49	*	*	*	26	25
Cotton						
Number of firms	4	4	4	2	3	16
% share of sample turnover	56	55	53	43	51	*
% share of sample net results	68	57	53	27	48	*
Hosiery & Knitting						
Number of firms	7	8	59	58	60	8
% share of sample turnover	67	70	*	*	*	63
% share of sample net results	67	70	*	*	*	69
Combination of sub-sectors						
Number of firms	5	5	5	4	5	5
% share of sample turnover	57	56	54	55	57	56
% share of sample net results	55	47	42	45	47	54

* No "oligopoly" can be said to exist when $N_m^* > 10$

Table 24 confirms that oligopoly groups in textile processing as a whole tended to account for lower proportions of profits than of sales and that this difference was more pronounced during the recession period than during the comparative boom years of 1968 and 1973. In hosiery, the profits of oligopoly groups represented a similar share of the sample turnover to that of total turnover. In the wool sub-sector the two largest firms in 1972 and 1973 appear to have operated with lower profit margins than the rest of the sample.

2. Enterprise Analysis

The firms included in the enterprise tables had at least £3 millions turnover in the three sub-sectors concerned in the U.K. and world-wide interests in these sub-sectors accounted for at least 50 per cent of total turnover from all activities. Figures used in the analysis were based on total (not just textile) interests and this permitted the use of consolidated accounts and consequent avoidance of distortions resulting from transfer pricing etc. Distortions resulting from inflation remain; these were discussed on page 63.

One of the least satisfactory aspects of the enterprise analysis is the exclusion of Courtaulds, the U.K.'s largest textile concern on the grounds that fibre-production and non-textile interests account for over 50 per cent of turnover. It should be re-emphasised that "shares of the sample totals" do not represent shares of textile markets but, in the case of the enterprise tables, indicate relative strengths of major companies engaged predominantly in the three sub-sectors.

(a) Turnover

The four largest firms in 1968 were Coats-Paton, English Calico, Carrington and Dewhurst and Viyella International. They represented an oligopoly group (defined by the Linda index) and together obtained 56 per cent of total turnover of the 49 firms. Following the merger into Carrington-Viyella in 1971, the oligopoly consisted of three firms and in 1973 their share of sample turnover had fallen to 50 per cent.

Over the six-year period, the overall degree of concentration of turnover among the aample of enterprises changed little.

(b) Other variables

The overall degree of concentration of other variables also remained fairly steady over the six years. Net profits, cash flow and net cash flow showed a slight increase in concentration in 1970, during the recession period but this was fairly marginal. Over the whole period, these variables remained more concentrated than turnover.

Gross investment became somewhat more concentrated than turnover throughout the period and net assets were more concentrated than equity. This may reflect the greater importance of loan capital in the larger companies with greater borrowing potential.

The least concentrated variable is exports, in contrast to the findings of the paper study. The long-established tradition of exporting in the textile industry continues to be reflected in overseas sales by smaller as well as large companies.

(c) Other variables in relation to size of turnover

The following table shows the shares of turnover and other variables accounted for by the "oligopoly group" and by the ten largest firms (in terms of sales turnover) in 1968, 1970 and 1973:

TABLE 25 : SHARES OF TURNOVER AND OTHER VARIABLES OF "OLIGOPOLY" GROUPS AND TEN LARGEST FIRMS (IN TERMS OF TURNOVER)

Variable	1968		1970		1973	
	4 firms	10 firms	4 firms	10 firms	3 firms	10 firms
Turnover	56	71	55	69	50	70
Net Profits	63	79	57	74	56	76
Cash Flow	62	77	58	73	52	73
Gross Investment	59	71	63	75	44	68
Equity	60	75	59	73	56	74
Exports	43	68	46	69	37	68
Net Assets	65	80	64	77	59	76
Net Cash Flow	60	76	56	72	55	74

This table shows that in 1968 the enterprises with the largest turnover accounted for an even greater percentage of all other variables, apart from exports. This demonstrates again the importance of exports to medium-size firms, without the branded nome-market products and overseas subsidiaries of the largest groups. This was especially in the woollen industry. In 1970, a recession year, the concentration of profits, cash flow and net cash flow in the hands of the largest enterprises decreased (a result consistent with the earlier analysis of activity units) but they were responsible for a greater proportion of capital investment. By 1973 this dominance of capital expenditure by the largest groups had again receded.

(d) Size and Profitability

As in the paper study, no significant correlations were found to exist between size of enterprise and rate of profit. The following regression equations were computed; in no case did the significance level of the regression coefficient approach even 10 per cent:-

$\frac{\text{Turnover}}{\text{Net assets}}$	v	Net assets	(to check whether larger firms achieved better utilisation of capital).
$\frac{\text{Net profit}}{\text{Turnover}}$	v	Turnover	
$\frac{\text{Net Profit}}{\text{Equity}}$	v	Equity	
$\frac{\text{Capital expenditure}}{\text{Cash Flow}}$	v	Cash Flow	

The absence of significant correlation is consistent with a number of other studies in this field. The subject is further discussed in the final section (section VI) but fuller understanding of reasons why significant relationships of this kind are seldom found must

await the conclusions of more detailed empirical research.

(e) Ranking according to different variables

One of the conditions necessary for more detailed analysis of the Linda indices is that the ranking of companies should be the same (or almost the same) for each of the variables. This was checked by rank correlation coefficients; the matrices for 1968 and 1973 are shown in Appendix D. Except an expected close correlation between rankings of net profits and cash flow the coefficients are too far from unity to permit the application of further analysis of Linda coefficients.

SECTION V

PRODUCT MARKET ANALYSIS

A. SPECIALISATION

Specialisation in the textile industries can be based either on end use (e.g. tyre cord, ladies' hosiery, hand-knitting yarns) or on technical distinctions (e.g. spinning of coarse yarns, weaving of coloured fabrics, warp-knitting). Product markets cannot be defined exclusively on either one of these criteria.

1. Degree of specialisation within each sub-sector

Traditionally the three sub-sectors were separated by geographical as well as product boundaries. The cotton industry was concentrated in Lancashire and trading was normally via the Manchester Exchange, where cloths produced by a large number of small companies was purchased by an equally large number of merchant converters, for home or export sale. The woollen and worsted industry was similarly focussed upon Bradford and the knitting industries on Leicester and Nottingham. Although the system of selling has now changed and the boundaries between products have been eroded by the widespread adoption of man-made fibres, the orientation of most of the medium-size and smaller firms remains within the old geographical limits. Trade associations, employers' federations, trade unions and technical institutions remain delineated by the cotton, woollen and worsted and hosiery and knitwear "industries".

The detailed statistical analysis in Section IV covered 150 companies in 1973 - these included the 60 largest in wool and in knitting and the 47 largest in cotton. Only two of the 150 companies were represented in the sample of largest activity units in every sub-sector (Courtaulds and Coats Paton); 13 were among the largest firms in two of the sub-sectors. Of the remaining 135 companies, represented among largest activity units in only one sub-sector; 30 had activities with less than £1 million turnover in either or both of the other two.

2. Specialisation among largest groups

Three enterprises - Courtaulds, Carrington-Viyella and Tootal supply many end-uses, having integrated forward to the final product. The structure of Courtaulds is such that its share of production diminishes at successive stages closer to the final market (greatest in spinning, less in weaving and knitting and least in finishing and making-up). There are some end products in which it is the market-leader (ladies' hosiery) and others in which its representation is negligible (sewing thread and tyre fabric). Tootal's structure is the inverse of that of Courtaulds: capacity in finishing and merchanting exceeds that in weaving and knitting which in turn use more yarn than is produced by the group's spinning mills. As a result of its merchanting activities, Tootal is able to advertise its ability to supply almost all categories of textile products (the few exceptions include tyre fabric and hose). Much of the cloth concerned is purchased outside the group. Carrington-Viyella is orientated towards a less wide range of final products but produces most of what it sells.

The other enterprises in the textile industries tend to be more specialised and some firms with annual turnover of over £15 million concentrate on only one or two products (Pretty Polly on ladies' hosiery, Sir James Hill on wool-combing, Dunlop Textiles and John Bright Group on tyre fabrics).

3. The role of small firms

One of the unexpected findings of a series of discussions with smaller firms was diversity of end-uses for which output was destined. The basis of specialisation in such undertakings is technical and the market advantage is ability to supply small quantities. Variety remains important and can be reconciled with the economic advantages of long runs on high-draft spinning frames and automatic looms through inter-company trading which is important in this, highly entrepreneurial, part of the textile industry.

B. ANALYSIS BY PRODUCTION PROCESS - INTERMEDIATE PRODUCTS

1. Preparation of Material for Worsted Spinning

One of the most capital-intensive processes in the wool sub-sector is the production of "tops" of wool which has been sorted, scoured and combed for worsted spinning. Man-made fibres have been introduced to this process: they are usually supplied in filament or tow (continuous band) and are then shredded or stretch broken for subsequent combing. Net output per employee in this activity in 1968 was more than double that for the woollen sub-sector as a whole.

In 1973, 24 enterprises were known by the Business Statistics Office to be engaged in the production of combed tops of wool and only six to be engaged in the similar processing of man-made fibres. Total sales of tops of wool, other animal hair and man-made fibres amounted to £112 millions in 1973; exports were worth £49 millions and imports only £5 millions.

Top-making is undertaken partly by large specialist firms and partly by worsted spinners. In recent years one of the largest woolcombing concerns (Woolcombers Ltd.) was gradually acquired by the large woollen and worsted combine Illingworth Morris Ltd.

About 35 per cent of the total weight of tops produced in 1973 consisted of man-made fibres and Courtaulds has built up its own worsted spinning division which accounted for over one-third of all man-made fibre tops produced in 1973,. I.C.I. does not appear to have any major direct investment in this activity.

2. Woollen yarn spinning

The spinning of yarn from carded wool remains a highly fragmented sector, though there are elements of concentration within it. Table 17 showed that the share of total production achieved by the five largest firms increased from 26 per cent in 1963 to 34 per cent in 1968. This ratio conceals the existence of concentration occurring

through vertical integration by large carpet producers. The proportion of woollen yarn going to carpet manufacturers rose from 40 per cent in 1968 to nearly 50 per cent in 1974. Most of the remainder went into weaving or was exported. Exports of woollen yarn, mainly to other E.E.C. or western European countries, amounted to £16 millions in 1973, about 11 per cent of total sales. Imports were negligible.

3. Worsted yarn spinning

Over 80 firms were engaged in worsted spinning in 1973 but, because of the economies gained by long production runs, there is considerable specialisation. Yarns for machine-knitting took 38 per cent of output in 1969 and by 1973 and 1974 this had risen to 48 per cent; the proportion of output sold as hand-knitting wool remained constant at about 16 per cent. (The structure of the market for hand-knitting wools is discussed in the next sub-section of this report,B.1). Total exports of worsted yarn in 1973 amounted to about £20 millions; 65 per cent of which was hand-knitting yarn. Imports were less than half this amount. Total sales by U.K. producers were about £170 millions. (6)

4. Spinning of cotton and man-made fibres

This is another activity in which long production runs are required. Vertically integrated groups now control a dominant proportion of spinning capacity and the Business Statistics Office data indicate that only 38 firms with over 25 employees spun single cotton yarn in the U.K. in 1973 compared with 51 in 1963. Imports of yarn have recently risen as certain weaving and knitting concerns have been able to buy yarn more cheaply overseas. Allegations have been made about the "dumping" of yarns, subsidisation by foreign governments eager to obtain foreign exchange and the effects of "dumping" by fibre producers of the U.S.A. and western Europe (including the U.K.) which has led to polyester/cotton mixed yarns entering the U.K. "at less than their fibre content would cost here". Some weaving concerns attributed yarn imports to a desire for independence from reliance on U.K. spinning subsidiaries of their major competitors.

The spinning of coarser yarns from cotton and man-made fibres has been more adversely affected by fabric imports than that of finer yarns. This is because cheaper more "basic" fabrics tend to use coarser yarns. On the other hand, spinners of fine yarns have been affected by the adoption of synthetic filament and this effect has been more severe (many mills in the former mule-spinning area around Bolton have been closed in the last few years). Output and consumption of spun yarns in 1968, 1973 and 1974 were as follows:-

	1968	1973	1974
Production (000 tonnes)	240	208	189
Exports	9	16	14
Imports	17	31	53
U.K. domestic use	248	223	228

(Note: Figures include yarns of cotton, cotton waste or man-made fibres spun on the cotton system.)

Concentration in cotton etc. spinning increased greatly during the period 1963-8, when the five-firm concentration ratio increased from 37 to over 50 per cent. Textile Council estimates for 1968 (3) show Courtaulds with 30 per cent of output, Carrington-Viyella (then two separate firms) with nine per cent and English Calico (Tootal) with eight per cent. More recent estimates are not available but these proportions are believed to have increased slightly.

The continued existence of the small firm in spinning appears, from discussions with such firms, to be due to the ability to exploit the advantages of smallness. Technical economies require long production runs and such firms normally specialise on urgent commission work or specialist orders. The ability of the proprietor or single manager to consider both production and marketing factors is reflected in price discrimination (recovery of the costs of urgent orders from the urgent customer and disposal of the balance of production on a marginal-cost basis) and in finely judged inventory policies.

5. Warp-knitting

In 1973 423 million m^2 of fabrics warp-knitted from synthetic filament yarn were sold by U.K. producers, 383 million m^2 to the home market. Imports were negligible. Of this volume, about 42 per cent was used in women's dresses and lingerie, about 20 per cent in other apparel and 31 in household textiles. Parts of this market, for example men's shirts and sheets have dwindled since 1973 because of competition from woven polyester/cotton mixtures. To this fashion trend has been added an increase in imports of warp-knitted synthetic-fibre garments. The slower growth and then the decline of U.K. demand for warp-knitted fabrics followed a boom in the late 1960's and has left this section of the industry with considerable excess capacity. Prices are low and the main pressure for lower prices has come from vertically integrated fibre producers eager to contribute to heavy fixed expenses not only in the capital-intensive warp-knitting section but also in their fibre-manufacturing facilities.

Of the 36 firms engaged in warp-knitting in 1973, by far the largest were subsidiaries of Courtaulds and Carrington-Viyella. In 1968 Courtaulds' share of warp-knitting output was estimated (3) at 35 per cent and this has probably increased; the combined share of Viyella International and Carrington and Dewhurst was 25 per cent but in more recent years Carrington-Viyella has rationalised its warp-knitting capacity and its current share of the market may be slightly lower. Discussions within the industry lead the author to believe that dominance by Courtaulds and I.C.I. (via Carrington-Viyella) is likely to increase and that prices will be such as to discourage new entrants and further growth of imports.

C. ANALYSIS OF SELECTED END USES

The variety of end uses of textile products make it necessary to confine this analysis to a number of examples which demonstrate the different competitive conditions. These are hand-knitting wool, coloured woven

woollen dress fabrics, sewing thread, shirts, bedding and ladies' hosiery. Among aspects examined are the degree of vertical integration to the consumer product, the importance of branded and unbranded items and the impact of foreign trade.

An attempt has been made in a number of cases to assess the shares of the market obtained by individual companies. This measurement is complicated (i) by the significant proportion of sales of many textile products achieved by major retail groups selling under their own brand labels and (ii) by the practice on the part of some textile firms of buying intermediate or even finished products from other U.K. companies or from overseas.

1. Hand-knitting yarn

This product has declined in the last few years with increasing efficiency and lower costs in the knitwear industry. In 1969 U.K. sales of hand-knitting yarn amounted to 16.3 million kg. and by 1974 had fallen to 13.1 million kg. This remains a large market with consumer sales value of about £55 millions.

Exports of hand-knitting yarns are about ten per cent of industry sales; imports are negligible. About 50 per cent of the fibre content of this yarn is now man-made fibre, especially acrylic and nylon, I.C.I. and Courtaulds direct advertising of such fibres to the hand-knitting consumer but are not themselves engaged in the production of hand-knitting yarns. Competitive advertising by the International Wool Secretariat emphasises the advantages of the natural fibre and a 1972 market research survey (12) reported some "basic preference" for wool.

Just under half of total sales of hand-knitting yarns are via specialist wool shops. Some of these (e.g. Bellmans and Scotch Wool Shops) are owned by the spinning companies (in that case Coats Paton). Variety of yarns on offer is a major competitive strategy by such shops and this means low retail stocks of any one product line. Conversely, the manufacturer is expected to hold large stocks as retail outlets advertise

their ability to obtain yarn quickly. One solution to the inventory problem, convenient to all parties, is the arrangement whereby the retailers "lay by" wool for the customers to purchase while they are knitting a garment. Provided delivery by the manufacturer is reliable, this need not tie up much of the retailer's stock. Since 1969 there has been some decline in the number of specialist wool shops and Coats Paton have closed some of their retail outlets. The major alternatives are department stores and chain stores; the latter sell "wool" under their own brand labels and usually concentrate on a narrow range with more rapid stock-turnover.

The 1972 Mintel research survey (14) showed that 15 companies accounted for 86 per cent of total sales and in 1973 some of these were merged through acquisitions. The following table uses Mintel's estimates of market shares:-

	per cent
Coats-Paton (including Bellmans)	33
Sirdar (including Hayfields, acquired 1973)	16
Robert Glew Ltd. (including Emu, acquired 1973)	10
Lister Brothers	5
Other firms	36
	100

As with many other textile products, brands of hand-knitting yarns are not heavily advertised by manufacturers and brand-awareness appears to be low. Advertising was estimated by Mintel to represent only about one per cent of sales (this figure does not include advertising by fibre manufacturers or the I.W.S.)

2. Coloured woven woollen tweeds

This specialisation is concerned mainly with heavier fabrics woven from dyed yarn and used for men's jackets and overcoats and women's coats, suits and skirts. This is traditionally a fairly fragmented sector and independent producers remain numerous. Vertically

integrated woollen mills produce most of this cloth, encompassing spinning, yarn dyeing,weaving and finishing but the dyeing and finishing processes are sub-contracted by some of the smaller firms to the larger enterprises possessing those facilities.

The market for this kind of fabric has contracted with the fashion trend towards lighter clothing, expecially among men. The trade in tweeds has also been adversely affected by imports of finished garments by retailers and more recently of fabrics, especially from Italy.

The fabric manufacturers sell their product to the clothing producers: vertical integration to making-up does not occur in this specialist sector. Much of the output of the clothiers is then sold by larger retail groups (men's and women's clothing is sold predominantly through multiple retail outlets: chains of clothing shops and of department stores). Overseas sales are made via agents to clothing manufacturers, mainly to Europe and North America. Two stages removed from the final consumer, tweed manufacturers have always been subject to wide variations in orders resulting from inventory adjustments on the part of customers. It was alleged in discussions that these variations have been aggravated by the practice of certain large retailing groups of buying the "base load" of some of their product lines overseas and using U.K. suppliers as a "tap" to meet the fluctuating element of demand. The adverse trading conditions now prevalent in the industry (1975) have led to greater competition for business, partly on price but also (in this essentially fashion-influenced trade) on cloth design and quality.

This specialisation is an example of several in the textile industry where growth beyond a certain size might reduce flexibility and ability to respond to different trading conditions and opportunities. Production economies, beyond a certain scale are not great and, because of the importance of variety, design and price, close links between production and marketing are necessary. In most cases these links are through one or two men at the head of the firm. The resulting fragmented structure of the manufacturing sector weakens its position in relation to that of its customers and, in this case, the ultimate

large buyers. The response of the manufacturers to current trends - new designs, improvements in production methods etc. - is likely to prevent an accelerating flow of imports. Discussions with retailers suggested that the difference in prices between imported and home-produced clothing was becoming too small to justify the sacrifice of easy communication with fabric designers and producers, of great importance in the fashion trades.

3. Sewing thread

This has for many years been one of the most concentrated sections of the cotton industry dominated by two companies, J.P. Coats (now part of Coats-Paton) and English Sewing Cotton (now part of Tootal). Although official statistics (6) show that 22 firms were engaged in the production of finished cotton thread for sewing and embroidery and 15 firms in the production of man-made fibre thread, in 1968, the five-firm concentration ratio was 88 per cent and the largest producers now share approximately equally about 75 per cent of total production.

The demand for sewing thread consists of industrial demand, mainly of spun synthetic fibres and of domestic purchases in which adherence to cotton has continued despite manufacturers' attempts to develop sales of synthetics with the more stable raw material price. J. P. Coats' share of each market is estimated, from a variety of sources including references (6) and (8) and company accounts, to be about 38 per cent. Tootal is stronger in the domestic thread market with about 50 per cent of sales but in the industrial market its share is closer to 25 per cent.

Earlier in this century, common marketing arrangements for thread on a world-wide basis were established and were dominated by Coats. Only by virtue of its size was English Sewing Cotton able to break away from this arrangement. Distributive links and branding are strong and, although profit margins are high, entry into this specialisation is not easy.

Imports of sewing thread for retail sale are negligible (200 tonnes in 1973) and exports (1,100 tonnes) represent only about 15 per cent of output. In part, this absence of trade is due to the international operations of Coats-Paton and to a lesser extent Tootal. These companies are described in greater detail in Appendix F.

The main reasons for dominance of the market by the two firms appear to be:

(a) economies of scale in production, but more important
(b) cumulative effects of long periods of leadership in marketing.

4. Men's and boy's shirts

Comprehensive data on sales of cotton and man-made fibre shirts are available only from 1971. The following table shows U.K. production, exports and imports in 1972 and 1973:-

	1972		1973	
	Millions	£millions	Millions	£millions
Made-up from woven cloth				
U.K. manufacturers	29.2	45.3	31.7	54.4
Exports	2.4	3.0	2.5	3.2
Imports	24.1	15.1	27.9	21.8
Estimated U.K. market	50.9	57.4	57.1	73.0
Knitted or made-up from knitted fabric				
U.K. Manufacturers	16.3	18.6	13.4	17.7
Exports	2.1	2.3	1.4	1.8
Imports	34.2	11.8	31.5	12.5
Estimated U.K. market	48.4	28.1	43.5	28.4

Sources: Business Monitor and Overseas Trade Accounts.

The data show that imports accounted for nearly 59 per cent of all shirts sold (by volume) in both 1972 and 1973. The volume figures are distorted by the inclusion of boys' knitted shirts and other low-value shirts in which imports predominate. In value terms the U.K. share of the domestic market was (after the addition of U.K. importers' margins) between 65 and 70 per cent.

The share of the market taken by knitted shirts has decreased considerably in recent years. In 1971 shirts knitted in the piece or made-up from knitted fabric accounted for 42 per cent of U.K. manufacturers' volume and 58 per cent of imports; by 1974 these percentages had fallen to 25 and 45.

Many of the major suppliers of shirts were acquired by textile manufacturing groups during the period of vertical integration between 1963 and 1968. The largest producer is now probably Carrington-Viyella with a wide range of cotton, cotton/wool and polyester/cotton woven shirts as well as warp-knitted nylon shirts. This company covers the complete range of the market from the least expensive to the "quality" end of the market selling under different brand-names associated with subsidiaries acquired by Viyella International and Carrington & Dewhurst during the 1960's. Tootal is also strongly represented in this market, with a variety of woven and knitted shirts but with a greater emphasis on the more expensive part of the market.

Certain of the shirt manufacturers, although operating their own U.K. spinning and weaving activities, import some of their shirts. These imports occur mainly when prices quoted by foreign producers are below marginal costs of production in the United Kingdom. This discrepancy occurs for a number of reasons, including the "dumping" of synthetic and natural fibres in some oriental markets as well as lower wage rates and (in the view of some observers) greater efficiency on the part of overseas producers. For this reason, U.K. brand names do not always imply production within the United Kingdom.

Another factor which hinders estimation of market shares by manufacturing

units is the significant role in this market of multiple retailers, handling about 30 per cent of shirts sold in 1972 (12). Major producers of shirts supply these customers with shirts usually with less variety of design or range of sizes and colours. This trade is very price-competitive: both the large retailers and their ultimate customers tending to be price-conscious. The relative importance of branded and unbranded shirts and the possible effects on the branded market of supply of quality shirts at low price to major retailers are constantly studied by the firms concerned.

From a market survey in 1972 (12) the major firms in the shirt market emerged as follows:-

	per cent
Marks and Spencer	15
Other "own label" retailers	15
Van-Heusen (Carrington-Viyella)	7
Rael Brook (Tootal)	5
Buckingham (William Baird)	4
Others	54

This information is slightly misleading because "others" include smaller subsidiaries of Carrington-Viyella and Tootal and because the major firms all supply the "own label" retailers. The shirt-making industry remins highly fragmented but Carrington-Viyella probably achieve between 12 and 15 per cent of market sales (12) and Carrington-Viyella, Tootal, Courtaulds and Baird probably together account for between 30 and 35 per cent of the market.

Despite the importance of branding for some of the major companies, advertising is low in relation to sales - only 0.2 per cent in 1971. This supports the view put forward by certain retailers during our survey that shirts were becoming a "commodity item".

5. Sheets and bedding

This is another product group which was affected by the changes in the structure of the textile industry in the 1960's. In that period

warp-knitted synthetic fabrics took an increasing share of this market and some of the major groups (especially Carrington & Dewhurst and Courtaulds) extended considerably their warp-knitting capacity.

The development, initially by Carrington-Viyella, of mixed polyester/cotton yarns and their use in woven sheets reversed the trend towards warp-knitted filament, because the new fabrics combined the comfortable feel of staple fibre with non-iron properties. The total output of sheets rose from 16.2 millions in 1972 to 21.2 millions in 1973 and 21.5 millions in 1974 but output of warp-knitted sheeting in 1974 was over 20 per cent below the 1972 level.

The market lead obtained by branded sheets developed by Carrington-Viyella, Tootal and a number of smaller specialist firms is threatened by imports. Imports of made-up woven sheets rose by only 9 per cent between 1972 and 1974 but imports of polyester/cotton fabric rose by 28 per cent in the same period. One of the factors appears to be the lower overseas price of polyester fibres. The importance of branding in bed linen is probably not great the demand for "seconds" (imperfect fabrics) has always been substantial at sheeting mills. This means that continued growth of sales of this product can be achieved only by cost reductions reflected in lower prices.

The partial takeover by Courtaulds of Highams, one of the larger of the producers of bedding after Carrington-Viyella and Tootal may be regarded as a further example of vertical integration as a means of securing an outlet for synthetic fibre. (Courtaulds is developing its polyester production.) This specialisation provides an archetype of the struggle for survival of the Lancashire textile industry and of the complex role in that struggle of the main fibre producers.

6. Women's hose (stockings and tights)

The structure of this activity has been changing rapidly with developments in technology. In 1963 there were 157 enterprises engaged in the production of women's hose; in 1973, 54. Changes which have taken place in design and technology include the moves to seamless stockings and, with the introduction of stretch nylon, to simple tubular construction (no fashioning, shaping or sizes) and then to

the sewing together of the nylon tubes into "tights". A further reduction in production costs is likely to result from the gradual adoption of a technique of producing tights in one piece, to eliminate the current practice of sewing the two tubular stockings together.

A number of factors have tended to reduce profit margins:-

(a) Intense competition between major companies, including subsidiaries of Courtaulds which now undertake about 35 per cent of U.K. production. (The second largest firm, Pretty Polly, a member of the Thomas Tilling group, accounts for about 25 per cent).

(b) A tendency for tights to be sold as a "commodity item". Four chain stores (Marks and Spencer, British Home Stores, Littlewoods and Woolworth) accounted for 25 per cent of sales in 1974, multiple food shops and co-operatives another 20 per cent and market stalls seven per cent (12). Both the chain stores and some of the multiple food shops sell tights under their own brand-names and, when sales via market stalls, garages and similar outlets are considered, it is probable that less than 40 per cent of tights are sold under the manufacturers' own brand name.

(c) A tendency for the total market to become static, in spite of lower prices. The total output of women's tights and full-length stockings (in millions of pairs) fell from 582 in 1972 to 568 in 1973 and rose in 1974 only to 580. This failure of the market to expand may be explained by the adoption by women of longer skirt lengths and of trousers.

Although imports of hose appear to be significant, a large proportion of these imports represents supplies from branch factories of British companies, especially Pretty Polly in the Irish Republic. About 20 per cent of U.K. output was exported in 1973 mostly to other E.E.C. countries.

Over the next few years, the supply of ladies hose is likely to become more concentrated as technological developments are associated with economies of scale. A major feature of the market is likely

to be an attempt by manufacturers to re-establish brand concepts in order to give them greater control over sales in what has become a market dominated by their major customers (a typical oligopsony). Sandwiched between large suppliers of filament yarn on the one hand and large customers on the other, producers of hose see a need to increase their own bargaining power.

SECTION VI

CONCENTRATION AND COMPETITION - SOME CONCLUDING COMMENTS

A. INTRODUCTION

The statistical analysis of the U.K. textile companies showed the existence of a small group of multi-fibre, multi-process companies accounting for over half of total sales. Analysis of financial links between companies, referred to in Sections III and IV and collated in Appendix E, reveals a further departure from the competitive structure which existed in these industries fifteen years ago.

The implications of this concentration for competition and particularly for pricing policies need to be considered against the background of competition between rival textile processes and, even more significant, the high level of imports. When account is taken of the fabric content of imported made-up textiles, the U.K. receives 57 per cent of its supply of cotton and man-made fibre fabrics from overseas. Although three firms control nearly half of output in this sector, their home sales represent under 20 per cent of the U.K. market. "Oligopoly" as defined in Section IV of this report is not the equivalent of the economist's concept of dominance by the few. Rather is it the result of a defensive reaction against imports on the one hand and concentration of customers on the other. The development of this concentration through vertical integration is due to the declared desire of fibre producers and of other textile firms to safeguard outlets for their products.

B. THE IMPACT ON COMPETITION OF VERTICAL INTEGRATION

The effects of vertical integration on company organisation and policy differ widely between enterprises. At one end of a spectrum, one group is reported by most observers to apply a fairly rigorous policy of "group net benefit" which means that group companies are expected to buy from each other rather than elsewhere and that transfer prices are based on the objectives of group sales growth and profitability. At the other extreme, another of the largest companies operates a principle of divisional autonomy, in the belief that the resulting incentive to profit centres provides greater advantages than attempts at central planning.

One of the features of the textile industry which emerged clearly from discussions was willingness of companies to market products purchased from competitors. Ability to offer complete ranges of products is regarded as a major marketing advantage but the economies of scale in production are increasing. Long production runs result in greater utilisation of machinery and if production is standardised, continuous shifts can be operated without duplication of senior management and technical personnel. Especially in the excess capacity situation in 1974 and 1975, this situation sometimes leads to fierce price competition: supply of a woven fabric to a competitor for finishing and making-up may be followed by a cut in the transfer price of that fabric and a competitive bid for the ultimate business.

The growth of vertical integration has caused some friction between the textile firms concerned and major customers used to placing orders in accordance with the industry's horizontal structure - negotiating with spinners, then with weavers and knitters and then with makers-up. The relative strength of the textile group and the retailer appears to depend upon the availability of substitutes. In the case of processing of acetate yarns for example, Courtaulds would be in a stronger position than with polyesters or nylon.

There are several indications that the competitive advantages of vertical integration have not yet been fully exploited by the undertakings concerned. In the competitive environment which is expected to continue over the next few years, the power of vertically integrated groups may be expected to increase. This is likely to lead to further growth of concentration as other firms combine to compete on more equal terms with existing groups on the one hand and imports on the other. Recent developments (e.g. the Spirella-Vantona merger) confirm this expectation.

C. THE ROLE OF IMPORTS

The future level of imports depends upon many factors, including trade restrictions, comparative exchange rates and relative inflation.

In the cotton sub-sector vertical integration is less important protection against imports as vertically integrated concerns are forced, by price competition, to import fabric at prices well below production costs in their own mills. The reasons for the relative price differential are complex:- U.K. mills no longer suffer from relative under-mechanisation; payments to labour are becoming a progressively smaller element of total costs. Major factors appear to be lower fibre prices in overseas countries, ability to achieve longer production runs by more narrow specialisation and heavy reliance on exports and, it is alleged, government subsidies to encourage earning of foreign exchange.

The short analysis of trading restrictions in Section II described how the 1973 multifibre agreement of GATT severely limits imposition of additional import quotas, especially those affecting developing countries. Recent proposals by the European Economic Commission would transfer most of the growth of textile imports to other member countries over the next few years but, in the longer term, import quotas are likely to provide decreasing protection.

Discussions with retailers indicated that they expected less growth of textile imports as price differentials narrowed. Communication with U.K. suppliers was sufficiently important to justify some differential on price. U.K. producers can respond more quickly to local fashion changes and with the reorganisation and increased efficiency which has been achieved are now becoming able to offset any price disadvantage. With certain more basic items of clothing, in which fashion is less important, growth of imports would in the absence of restrictions continue unless price differentials were to be narrowed appreciably.

D. THE FUTURE OF COMPETITION

In view of world excess capacity in textiles, the existence of access to overseas supplies is bound to limit prices in the United Kingdom textile industry in the immediate future. This excess capacity is particularly prevalent in warp-knitting, weaving of "grey" fabrics from cotton and man-made fibres and in fibre production. Competition between fibre producers may well lead to further acquisition or intervention in the processing sector, if Government policy allows this.

In this competitive environment, it is likely that the largest concerns, especially those financially linked with fibre producers will adopt aggressive pricing policies. The reductions of profit margins by the largest groups during the 1969/71 recession were greater than those of smaller firms (See Section IV). In the case of Courtaulds, which appears to have led this price-cutting, this has been attributed to an attempt to increase its share of the market. While this interpretation may explain part of the policy there are other reasons why fibre producers and textile groups which they control may decide to cut prices sharply during recession periods:-

(1) They tend to operate the most capital-intensive units in textile processing and have a predominance of fixed expenses.

(2) A long-term concern is the preservation of textile processing in this country, which means that imports must be countered during periods of world excess capacity.

(3) The economics of fibre production may justify under-recovery even of marginal costs in textile processing if the overall contribution to overheads in fibre production and processing is positive.

For these reasons the author expects the current (1974/5) period of intense competition (especially on price) to continue. This is likely to undermine the stability of the present structure of the textile industries and in all three sub-sectors is likely to lead to further pressure towards increased concentration. .

A P P E N D I C E S

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APPENDIX A: PART 1

LIST OF ENTERPRISES SHOWING TEXTILE AND NON-TEXTILE ACTIVITIES 1968

£m	TOTAL TURNOVER		Published or est. TEXTILE TURNOVER		Published or est. NET PROFITS	
Name of Company	World-wide	U.K.	Worldwide	U.K.	World-wide	U.K. Textiles
Courtaulds (N.E.)	577	452	265 (e)	228(e)	51.0(e)	12.0(e)
Tootal	151	108	121	78	9.6	4.5
Coats Paton	210	85	171	78	23.3	3.5
Viyella International	70.2			70.2	5.7	5.7
Carrington & Dewhurst	68.6			68.6	5.5	5.5
Illingworth Morris	29.9			29.9	1.4	1.4
Lister & Company	27.1			27.1	1.4	1.4
Woolcombers	23.4			23.4	0.2	0.2
Nottingham Manufacturing Co.	19.9			19.9	4.3	4.3
Corah	18.5			18.5	1.6	1.6
Joseph Dawson	16.9			16.9	2.5	2.5
William Baird Group+	31.4	24.6	16.2	16.2	3.4	1.0
Rexmore	13.6	13.6	10.4	10.4	0.93	0.77
John Bright Group	12.5			12.5	0.49	0.49
Vantona	11.5			11.5	0.83	0.83
Sir James Hill & Sons	11.3			11.3	0.22	0.22
Bulmer & Lumb (Hdgs)	10.7			10.7	0.55	0.55
Readson	10.6	10.6	10.0	10.0	0.38	0.37
Parkland Textiles	9.7			9.7	0.67	0.67
Thomas Tilling/ Pretty Polly+	190	n.a.	n.a.	8.8	8.63	1.03
Dunlop+	450	n.a.	n.a.	7.8	27.7	0.24
Allied Textiles	7.6			7.6	0.57	0.57
David Whitehead & Sons	7.4			7.4	0.34	0.34
Highams	6.9			6.9	0.45	0.45
Spirella	6.9			6.9	0.48	0.48

£m Name of company	TOTAL TURNOVER World-wide	 U.K.	Published or est. TEXTILE TURNOVER Worldwide	 U.K.	Published or est. NET PROFITS World-wide	 U.K. Textiles
Troydale Industries	6.9	6.9	4.7	4.7	0.32	0.25
W. & J. Whitehead	6.0			6.0	0.31	0.31
Smith & Nephew+	34.4	25.7	n.a.	5.9	5.59	0.55
Reed International (N.E.)	250	176	n.a.	5.7	14.2	0.40
Sirdar	5.5	5.5	4.0	4.0	0.57	0.34
Nova (Jersey) Knit (N.A.)	5.5			2.2	0.70	not estd. (N.A.)
John Foster & Son	5.4			4.2	0.28	0.22
John Beales Assocn.	5.3			5.3	0.36	0.36
Charnos	5.0			5.0	0.62	0.62
John Hawkins	9.2			9.2	0.04	0.04
John Emsley	5.0			5.0	0.09	0.09
Wormalds, Walker & Atkinson	4.9			4.9	0.28	0.28
John Crowther Group	4.8			4.8	0.21	0.21
George Spencer Group	4.6			4.6	0.41	0.41
Hicking Pentecost	4.3			4.3	0.30	0.30
Bear Brand	4.1			4.1	-0.28	-0.28
Stenhouse (Textiles)	4.1			4.1	0.31	0.31
India Mills (Darwen)	3.9			3.9	-0.13	-0.13
Scottish Worsted & Woollens	3.9			3.9	-0.21	-0.21
Albert Martin	3.9			3.9	0.33	0.33
Slater Walker Securities+	-	-	-	3.8	4.87	0.10
British Mohair Spinners	3.8			3.8	0.40	0.40
John Haggas	3.7			3.7	0.36	0.36
Harold Laycock	3.7			3.7	0.26	0.26
Atkins Brothers	3.6			3.6	0.27	0.27
Hield Brothers	3.6			3.6	0.33	0.33

NOTES

N.E. = This company was not included in the enterprise analysis because turnover in textile processing accounted for less than 50% of company turnover.

N.A. = Not included in activity unit analysis.

+ = These companies published separate consolidated accounts summarising U.K. textile activities. In the enterprise analysis these textile accounts were used because of the greater relevance of the data. World-wide data for the whole group are included here to make possible comparisons in this Appendix.

Where overseas activities are very small (less than £500,000 turnover) they have been ignored in this table.

APPENDIX A: PART 2

LIST OF ENTERPRISES, SHOWING TEXTILE AND NON-TEXTILE ACTIVITIES 1973

£m	TOTAL TURNOVER		Published or est. TEXTILE TURNOVER		Published or est. NET PROFITS	
Name of Company	World-wide	U.K.	Worldwide	U.K.	World-wide	U.K. Textiles
Courtaulds (N.E.)	956	717	440(e)	385(e)	116.3	20.8(e)
Carrington-Viyella	184	154	184	154	12.1	10.1
Coats Pator	415	136	358	136	54.1	10.6
Tootal	215	118	192	94.7	18.3	7.96
Illingworth Morris	85.6	82.9	85.6	82.9	4.47	4.40
Nottingham Manufacturing Co.	63.3	63.3	48.2	48.2	10.21	9.47
Joseph Dawson(Hdgs)	37.3			37.3	5.41	5.41
William Baird Group+	53.1	43.1	29.7	29.7	2.94	1.17
Vantona	38.3	35(e)	38.3	35(e)	3.60	3.0(e)
Spirella	25.8			25.8	1.71	1.71
Readson	21.5	21.5	21.0	21.0	1.56	1.48
Rexmore	37.3	37.3	28.2	28.2	2.65	1.94
Lister & Co.	26.6			26.6	1.44	1.44
Corah	22.3			22.3	1.61	1.61
Thomas Tilling/ Pretty Polly+	510.9	n.a.	n.a.	21.8	34.4	1.22
Sir James Hill & Sons	17.9			17.9	0.19	0.19
Bulmer & Lumb (Hdgs)	13.1			13.1	0.52	0.52
Parkland Textiles	18.1			18.1	1.01	1.01
John Bright Group	14.0			14.0	0.88	0.88
Dunlop+	750	286	n.a.	9.0	11.7	0.28
Allied Textiles	21.9			21.9	2.17	2.17
Lonrho+	27.4	25(e)	23.4	20.0	29.4	3.43
Highams	13.9			13.9	0.72	0.72
Bodycote International	19.1	15.4	18.9	15.2	1.42	1.10
Troydale Industries	7.3	7.34	5.83	5.8	0.31	0.33

£m Name of Company	TOTAL TURNOVER World-wide	 U.K.	Published or est. TEXTILE TURNOVER Worldwide	 U.K.	Published or est. NET PROFITS World-wide	 U.K. Textiles
W. & J. Whitehead	12.0			12.0	0.72	0.72
Smith & Nephew+	84.1	n.a.	15.5	9.4	10.4	0.76
Reed International (N.E.)	598	534	n.a.	9.5	42.6	0.55
Sirdar	10.5	8.3	10.5	8.3	0.61	0.51
Nova (Jersey) Knit	8.5	7.6	8.5	7.6	0.08	0.44
John Foster & Son	9.6	8.7	7.9	6.8	0.96	0.72
John Beales Assocn.	8.1			8.1	0.64	0.64
Charnos	10.4			10.4	0.43	0.43
John Hawkins & Son (Hdgs)	8.6			8.6	0.51	0.51
Wormalds, Walker & Atkinson	5.8			5.8	0.26	0.26
John Crowther Group	3.7			3.7	0.53	0.53
George Spencer Group	8.6			8.6	0.62	0.62
Hicking Pentecost	5.3			5.3	0.44	0.44
Bear Brand	1.6			1.6	0.10	0.10
Stenhouse (Textiles)	3.4			3.4	0.07	0.07
Scottish Worsted & Woollens	5.6			5.6	0.44	0.44
Albert Martin	7.0			7.0	0.50	0.50
British Mohair Spinners	12.4			12.4	1.71	1.71
John Haggas	12.7			12.7	1.68	1.68
Harold Laycock	7.1			7.1	0.56	0.56
Atkins Erothers	5.3			5.3	0.40	0.40
Hield Brothers	6.8			6.8	0.72	0.72
Richard Roberts	7.9			7.9	0.48	0.48
Richards	5.9			5.9	0.50	0.50
Carpets International (N.E.)	73.5	51.8	n.a.	12.4	7.91	0.25

£m	TOTAL TURNOVER		Published or est. TEXTILE TURNOVER		Published or est. NET PROFITS	
Name of Company	World-wide	U.K.	Worldwide	U.K.	World-wide	U.K. Textiles
House of Lerose	7.8	5.1	7.8	5.1	1.20	0.78
R. & J. Pullman	7.7	7.7	7.3	7.3	0.94	0.01
RKT Textiles	7.8			7.8	0.69	0.69
T. W. Kempton	4.6			4.6	0.31	0.31
S. Lyles & Co.	8.0			8.0	1.28	1.28
Scottish, English & European Textiles	5.7			5.7	0.30	0.30
Stroud, Riley Drummond	6.8			6.8	0.50	0.50
U U Textiles	6.6			6.6	0.22	0.22

Notes as for Part 1.

TABLES OF CONCENTRATION

ENTERPRISES

SECTOR TEXTILES (NICE 23) U.K.

Prepared at the Cranfield Institute of Technology, Bedford

TABLE 1: SUM TOTAL VALUES 1968-73 (SAMPLE OF ENTERPRISES) (N* = number of positive values)

	N*	£ 000	1968=100	N*	£ 000	1968=100
	VARIABLE 01: TURNOVER			VARIABLE 04: NET PROFIT		
1968	49	896,819	100	46	70,866	100
1969	52	1,044,744	116	49	62,808	89
1970	52	1,084,407	121	45	57,387	81
1971	52	1,143,921	128	48	73,859	104
1972	53	1,316,186	147	50	105,854	149
1973	55	1,612,905	180	55	149,847	211
	VARIABLE 05: CASH FLOW			VARIABLE 06: GROSS INVESTMENT		
1968	46	95,213	100	49	42,698	100
1969	49	88,769	93	52	69,781	163
1970	50	83,973	88	52	60,720	142
1971	49	105,006	110	52	43,197	101
1972	52	140,304	147	53	49,666	116
1973	55	188,981	198	55	70,771	166
	VARIABLE 07: EQUITY			VARIABLE 08: EXPORTS		
1968	49	381,078	100	46	100,612	100
1969	52	401,680	105	50	125,770	125
1970	52	422,588	111	50	126,734	126
1971	52	428,738	112	51	137,642	137
1972	52	472,925	124	51	157,661	157
1973	55	539,739	141	53	218,857	218
	VARIABLE 10: NET ASSETS			VARIABLE 11: NET CASH FLOW		
1968	49	511,531	100	46	64,389	100
1969	52	571,028	111	49	61,639	95
1970	52	611,685	119	50	61,306	95
1971	52	620,575	121	49	69,763	108
1972	53	672,312	131	51	91,891	142
1973	55	782,733	153	55	123,533	191

TABLE 2: MEASURES OF CONCENTRATION (SAMPLE OF ENTERPRISES)

	N*	MEAN	V	GINI	H-H	ENTRO*
1968						
01 Turnover	49	18,302	1.997	0.6321	101.8	-129.
04 Net Profit	46	1,541	2.400	0.7141	147.0	-115.
05 Cash Flow	46	2,070	2.309	0.6959	137.7	-118.
06 Gross Investment	49	877	2.117	0.7239	111.9	-121.
07 Equity	49	7,777	2.375	0.7072	135.5	-119.
08 Exports	46	2,187	1.608	0.6599	78.0	-130.
10 Net Assets	49	10,439	2.536	0.7379	151.6	-113.
11 Net Cash Flow	46	1,400	2.215	0.6810	128.4	-120.
1969						
01 Turnover	52	20,091	2.099	0.6423	104.0	-131.
04 Net Profit	49	1,282	2.392	0.6994	137.1	-120.
05 Cash Flow	49	1,812	2.369	0.6895	135.0	-121.
06 Gross Investment	52	1,342	3.286	0.8046	226.9	-100.
07 Equity	52	7,725	2.370	0.6911	127.2	-123.
08 Exports	50	2,515	1.835	0.6636	87.3	-13?.
10 Net Assets	52	10,891	2.660	0.7324	155.3	-115.
11 Net Cash Flow	49	1,258	2.374	0.6839	135.4	-121.
1970						
01 Turnover	52	20,854	2.187	0.6422	111.2	-129.
04 Net Profit	45	1,275	2.593	0.7267	171.6	-110.
05 Cash Flow	50	1,679	2.665	0.7118	162.1	-115.
06 Gross Investment	52	1,168	3.144	0.7711	209.3	-107.
07 Equity	52	8,127	2.403	0.6911	130.3	-123.
08 Exports	50	2,535	1.8670	0.6610	89.7	-131.
10 Net Assets	52	11,763	2.7825	0.7307	168.1	-114.
11 Net Cash Flow	50	1,226	2.5103	0.6894	146.0	-119.

Note: The mean figures are in thousands of pounds; definitions of the four concentration measures are given on page

TABLE 2: MEASURES OF CONCENTRATION (SAMPLE OF ENTERPRISES) (Cont'd)

	N*	MEAN	V	GINI	H-H	ENTROPY
1971						
01 Turnover	52	21,998	2.235	0.6553	115.3	-127.2
04 Net Profit	48	1,539	2.637	0.7291	165.7	-113.2
05 Cash Flow	49	2,143	2,578	0.7135	156.1	-115.8
06 Gross Investment	52	831	2.038	0.6776	99.1	-128.1
07 Equity	52	8,245	2.443	0.6990	134.0	-121.0
08 Exports	51	2,699	1.888	0.6982	89.5	-127.8
10 Net Assets	52	11,934	2.771	0.7334	166.9	-113.2
11 Net Cash Flow	49	1,424	2.435	0.6828	146.5	-120.3
1972						
01 Turnover	53	24,834	2.224	0.6548	112.2	-128.5
04 Net Profit	50	2,117	2.588	0.7108	153.9	-118.0
05 Cash Flow	52	2,698	2.567	0.7065	146.0	-120.0
06 Gross Investment	53	937	2.104	0.7056	102.4	-125.8
07 Equity	52	9,095	2.431	0.7063	132.9	-120.8
08 Exports	51	3,091	1.820	0.6790	84.6	-130.1
10 Net Assets	53	12,685	2.725	0.7280	159.0	-114.7
11 Net Cash Flow	51	1,801	2.433	0.6786	135.6	-123.6
1973						
01 Turnover	55	29,326	2.197	0.6562	106.0	-130.6
04 Net Profit	55	2,724	2.815	0.7431	162.2	-116.0
05 Cash Flow	55	3,436	2.699	0.7209	150.7	-119.0
06 Gross Investment	55	1,287	1.958	0.6972	87.9	-129.9
07 Equity	55	9,807	2.488	0.7163	130.7	-121.7
08 Exports	55	4,129	1.867	0.683	84.7	-131.1
10 Net Assets	55	14,232	2.690	0.7289	149.8	-116.9
11 Net Cash Flow	55	2,246	2.613	0.7105	142.3	-120.9

Note: The mean figures are in thousands of pounds; definitions of the four concentration measures are given on page

TABLE 3: LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

VARIABLE 01: TURNOVER

N*		1968	1969	1970	1971	1972	1973
4	L CR	0.573 55.7	0.669 54.1	0.716 55.3	0.889 57.4	0.683 57.6	0.673 55.7
8	L CR	0.545 66.9	0.544 65.5	0,593 65.5	0.662 66.8	0.663 66.7	0.580 66.6
10	L CR	0.475 70.8	0.461 69.8	0.514 69.2	0.539 70.7	0.539 70.6	0.521 70.1
12	L CR	0.422 74.2	0.388 73.8	0.446 72.5	0.457 74.2	0.475 73.6	0.464 73.1
20	L CR	0.297 83.6	0.290 83.1	0.285 82.9	L.319 83.6	0.317 82.9	0.306 82.7
30	L CR	0.948 90.9	0.224 90.7	0.219 90.7	0.240 90.7	0.233 90.5	0.234 89.9
40	L CR	0.983 96.2	0.190 95.6	0.186 95.8	0.194 96.0	0.192 95.8	0.191 95.0

SUMMARY COEFFICIENTS OF LINDA CURVES

1st Maximum	L CR N*H<	0.7462 48.06 3	0.8808 40.28 2	0.9820 41.57 2	0.9309 40.76 2	0.9565 40.45 2	0.9638 39.03 2
Overall Maximum	L CR N*H	0.7462 48.06 3	0.8808 40.28 2	0.9820 41.57 2	0.9309 40.76 2	0.9565 40.45 2	0.9638 39.03 2
1st Minimum	L CR N*M LS	0.5731 55.71 4 0.673	0.6694 54.11 4 0.802	0.7158 55.27 4 0.866	0.5731 54.16 3 0.752	0.6314 52.28 3 0.794	0.6325 50.41 3 0.798

TABLE 3: LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

VARIABLE 04: NET PROFIT BEFORE TAX

N*		1968	1969	1970	1971	1972	1973
4	L	0.721	0.774	0.814	0.763	0.865	0.834
	CR	62.3	58.6	67.1	65.4	60.4	63.3
8	L	0.626	0.604	0.855	0.793	0.634	0.664
	CR	76.1	71.7	75,5	74.2	72.7	74.8
10	L	0.581	0.531	0.724	0.678	0.577	0.622
	CR	79.5	75.5	78.6	77.5	76.3	78.1
12	L	0.532	0.476	0.606	0.580	0.523	0.580
	CR	82.2	78.6	81.6	80.4	79.2	80.5
20	L	0.418	0.335	0.410	0.371	0.354	0.404
	CR	89.2	87.5	89.8	89.6	87.8	88.2
30	L	0.321	0.265	0.308	0.300	0.281	0.325
	CR	94.8	94.2	96.1	95.6	94.1	93.7
40	L	0.259	0.224	0.292	0.27)	0.244	0.275
	CR	98.9	98.7	99.7	99.0	98.1	97.3

SUMMARY COEFFICIENTS OF LINDA CURVES

1st Maximum	L	1.2180	1.4254	1.2822	1.3945	1.5432	1.4765
	CR	46.43	43.87	43.87	49.18	46.79	48.37
	N*H<	2	2	2	2	2	2
Overall Maximum	L	1.2180	1.4254	1.2822	1.3945	1.5432	1.4765
	CR	46.43	43.87	43.87	49.18	46.79	48.37
	N*H	2	2	2	2	2	2
1st Minimum	L	0.6037	0.2228	0.8144	0.7634	0.2405	0.2604
	CR	71.84	98.98	67.08	65.45	98.77	98.15
	N*M	6	41	4	4	43	44
	LS	0.827	0.412	0.012	1.071	0.440	0.469

TABLE 3: LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

VARIABLE 05: CASH FLOW (BEFORE TAX)

N*		1968	1969	1970	1971	1972	1973
4	L CR	0.690 61.4	0.761 58.7	0.810 65.1	0.732 65.1	0.821 60.7	0.787 62.6
8	L CR	0.621 74.4	0.625 72.0	0.876 72.8	0.811 73.4	0.667 72.0	0.670 73.5
10	L CR	0.572 77.7	0.579 75.1	0.762 75.6	0.689 76.5	0.608 75.3	0.635 76.5
12	L CR	0.514 80.6	0.520 77.9	0.646 78.2	0.591 79.3	0.557 77.8	0.582 79.0
20	L CR	0.388 88.2	0.346 86.7	0.401 86.4	0.378 87.9	0.358 86.4	0.399 86.6
30	L CR	0.299 94.1	0.267 93.4	0.277 93.8	0.296 94.3	0.271 93.3	0.311 92 4
40	L CR	0.239 98.6	0.222 98.0	0.232 98.6	0.254 98.2	0.235 97.4	0.258 96.3

SUMMARY COEFFICIENTS OF LINDA CURVES

1st Maximum	L CR N*H<	1.0696 45.68 2	1.2285 44.6 2	1.2068 50.1 2	1.3023 47.7 2	1.3904 45.9 2	1.3489 46.8 2
Overall Maximum	L CR N*H	1.0696 45.68 2	1.2285 44.6 2	1.2068 50.1 2	1.3023 47.7 2	1.3904 45.9 2	1.3489 46.8 2
1st Minimum	L CR N*M LS	0.6138 66.82 5 0.829	0.6137 64.70 5 0.911	0.8103 65.1 4 1.017	0.7317 65.1 4 0.972	0.2240 98.5 46 0.419	0.7869 62.6 4 1.026

TABLE 3: LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

VARIABLE 06: GROSS INVESTMENT

N*		1968	1969	1970	1971	1972	1973
4	L	0.565	1.060	1.295	0.602	0.524	0.337
	CR	58.7	70.9	63.4	56.2	57.9	55.2
8	L	0.462	0.867	0.731	0.516	0.495	0.418
	CR	73.5	80.7	76.0	68.0	70.5	70.1
10	L	0.434	0.717	0.603	0.453	0.432	0.421
	CR	77.7	84.3	80.3	72.2	74.8	73.8
12	L	0.401	0.645	0.530	0.401	0.418	0.390
	CR	81.3	87.1	83.7	75.6	77.8	76.9
20	L	0.314	0.539	0.438	0.294	0.302	0.290
	CR	90.6	93.1	91.2	85.1	87.0	86.2
30	L	0.294	0.473	0.350	0.217	0.234	0.235
	CR	95.9	96.7	96.2	92.9	94.3	93.1
40	L	0.279	0.434	0.332	0.188	0.227	0.201
	CR	98.9	98.9	98.9	98.1	98.1	97.6

SUMMARY COEFFICIENTS OF LINDA CURVES

1st Maximum	L	0.7773	1.9392	2.1878	0.5251	0.5082	0.5917
	CR	40.39	55.92	53.20	36.74	35.95	31.46
	N*H<	2	2	2	2	2	2
Overall Maximum	L	0.7773	1.9392	2.1878	0.6019	0.5536	0.5917
	CR	40.39	55.92	53.20	56.19	61.93	31.46
	N*H	2	2	2	4	5	2
1st Minimum	L	0.3044	0.5927	0.3413	0.3956	0.3556	0.3366
	CR	92.08	89.25	96.60	51.67	52.57	55.2
	N*M	22	14	31	3	3	4
	LS	0.4319	0.9306	0.6340	0.460	0.432	0.446

TABLE 3: LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

VARIABLE 07: EQUITY

N*		1968	1969	1970	1971	1972	1973
4	L CR	0.776 60.5	0.753 58.2	0.755 58.6	0.760 62.2	0.719 62.0	0.732 61.2
8	L CR	0.610 71.5	0.597 69.5	0.623 70.2	0.709 71.3	0.681 71.9	0.656 72.1
10	L CR	0.501 76.0	0.502 73.8	0.534 74.1	0.613 74.7	0.592 75.4	0.557 75.8
12	L CR	0.443 79.6	0.454 77.0	0.501 76.8	0.557 77.3	0.532 78.2	0.504 78.8
20	L CR	0.349 88.4	0.324 86.1	0.336 85.6	0.360 86.0	0.360 86.6	0.383 86.3
30	L CR	0.282 94.4	0.258 92.7	0.259 92.6	0.274 92.6	0.280 93.0	0.290 92.5
40	L CR	0.247 98.3	0.215 97.3	0.217 97.2	0.225 97.2	0.230 97.5	0.237 96.7

SUMMARY COEFFICIENTS OF LINDA CURVES

1st Maximum	L CR N*H<	0.9603 54.1 3	1.0427 44.5 2	1.1165 44.6 2	1.0623 43.9 2	1.0955 43.5 2	1.0657 43.4 2
Overall Maximum	L CR N*H	0.9603 54.1 3	1.0427 44.5 2	1.1165 44.6 2	1.0623 43.9 2	1.0955 43.5 2	1.0657 43.4 2
1st Minimum	L CR N*M LS	0.9503 46.7 2 -	0.7534 58.2 4 0.931	0.6977 63.0 5 0.891	0.6355 57.3 3 0.849	0.6470 56.6 3 0.871	0.6660 55.9 3 0.866

TABLE 3: LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

VARIABLE 08: EXPORTS FROM THE U.K.

N*		1968	1969	1970	1971	1972	1973
4	L CR	0.519 45.9	0.585 48.6	0.623 49.0	0.453 52.2	0.372 52.6	0.412 52.0
8	L CR	0.318 66.4	0.386 66.9	0.368 66.8	0.392 71.0	0.411 69.4	0.451 67.4
10	L CR	0.294 71.7	0.365 71.3	0.347 71.6	0.371 75.5	0.376 73.7	0.414 71.3
12	L CR	0.267 76.4	0.342 74.9	0.334 75.2	0.356 78.9	0.357 77.1	0.364 74.9
20	L CR	0.207 89.7	0.243 85.8	0.250 85.9	0.295 87.8	0.277 86.3	0.251 85.9
30	L CR	0.210 96.8	0.197 94.4	0.202 94.0	0.230 94.9	0.220 93.8	0.201 94.1
40	L CR	0.250 99.4	0.203 98.5	0.204 98.1	0.225 98.6	0.201 98.3	0.202 98.0

SUMMARY COEFFICIENTS OF LINDA CURVES

1st Maximum	L CR N*H<	0.6178 31.85 2	0.8497 34.74 2	0.9077 35.5 2	0.7160 33.3 2	0.5542 31.3 2	0.6070 35.6 2
Overall Maximum	L CR N*H	0.6178 31.85 2	0.8497 34.74 2	0.9077 35.5 2	2.215 100 51	0.657 100 51	0.6438 100 53
1st Minimum	L CR N*M LS	0.2954 63.64 7 0.469	0.3591 64.64 7 0.574	0.1946 95.7 33 0.328	0.3317 65.9 6 0.480	0.4089 67.0 7 0.406	0.3460 59.8 4 0.462

TABLE 3: LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

VARIABLE 1.1: NET ASSETS

N*		1968	1969	1970	1971	1972	1973
4	L	0.730	0.742	0.901	0.892	0.913	0.657
	CR	64.9	64.3	63.9	66.7	66.4	65.9
8	L	0.689	0.700	0.734	0.834	0.854	0.758
	CR	77.1	76.0	75.3	75.5	74.8	75.2
10	L	0.602	0.629	0.664	0.728	0.720	0.671
	CR	80.6	79.2	78.4	78.5	77.9	78.3
12	L	0.565	0.591	0.622	0.656	0.653	0.637
	CR	83.1	81.6	80.7	80.9	80.3	80.5
20	L	0.451	0.448	0.426	0.446	0.450	0.453
	CR	89.5	88.3	88.2	88.2	87.3	87.0
30	L	0.351	0.350	0.339	0.349	0.337	0.347
	CR	94.6	93.4	93.4	93.4	92.8	92.1
40	L	0.284	0.283	0.279	0.284	0.263	0.266
	CR	98.3	97.1	97.1	97.1	96.8	96.3

SUMMARY COEFFICIENTS OF LINDA CURVES

1st Maximum	L	0.9754	1.1931	1.3618	1.2836	1.0587	1.2444
	CR	48.98	48.42	50.22	49.1	49.2	45.8
N*H<		2	2	2	2	2	2
Overall Maximum	L	0.9754	1.1931	1.3618	1.2836	1.0587	1.2444
	CR	48.98	48.42	50.22	49.1	49.2	45.8
N*H		2	2	2	2	2	2
1st Minimum	L	0.6475	0.6888	0.2462	0.7537	0.6986	0.6568
	CR	70.31	69.13	99.80	62.2	62.2	65.9
N*M		5	5	50	3	3	4
LS		0.810	0.905	0.458	1.019	-	0.873

TABLE 3: LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

VARIABLE 12: CASH FLOW AFTER TAX

N*		1968	1969	1970	1971	1972	1973
4	L	0.659	0.787	0.726	0.781	0.432	0.713
	CR	59.7	58.3	62.9	61.0	43.7	62.1
8	L	0.588	0.620	0.812	0.744	0.362	0.661
	CR	72.6	72.0	70.9	70.0	57.8	72.7
10	L	0.522	0.581	0.701	0.622	0.321	0.624
	CR	76.4	75.1	73.9	73.5	62.5	75.7
12	L	0.477	0.530	0.614	0.532	0.288	0.556
	CR	79.4	77.7	76.4	76.6	66.5	78.3
20	L	0.360	0.355	0.371	0.340	0.193	0.392
	CR	87.3	86.2	85.2	85.9	79.3	86.0
30	L	0.274	0.269	0.257	0.257	0.150	0.302
	CR	93.9	92.9	92.9	93.3	89.6	91.9
40	L	0.225	0.221	0.210	0.220	0.131	0.244
	CR	98.4	97.6	98.1	97.8	96.0	96.1

SUMMARY COEFFICIENTS OF LINDA CURVES

1st Maximum	L	1.0667	1.2759	1.1979	1.4038	1.6202	1.3748
	CR	43.77	44.37	47.0	46.1	42.9	44.6
	N*H<	2	2	2	2	2	2
Overall Maximum	L	1.0667	1.2759	1.1979	1.4038	1.6202	1.3748
	CR	43.77	44.37	47.0	46.1	42.9	44.6
	N*H	2	2	2	2	2	2
1st Minimum	L	0.6041	0.6056	0.7262	0.7809	0.1987	0.7131
	CR	68.84	64.70	62.9	61.0	97.9	62.1
	N*M	5	5	4	4	48	4
	LS	0.809	0.926	0.962	1.086	0.386	0.976

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1968

N*	TURNOVER	NET PROFIT	CASH FLOW	GROSS INVESTMENT
2	0.6982	1.2180	1.0696	0.7773
3	0.7462	0.9861	0.9409	0.5986
4	0.5731	0.7207	0.6902	0.5687
5	0.6467	0.6066	0.6138	0.5567
6	0.6149	0.6037	0.6244	0.5317
7	0.5767	0.6338	0.6303	0.5060
8	0.5446	0.6260	0.6207	0.4617
9	0.5072	0.5856	0.5938	0.4583
10	0.4745	0.5305	0.5721	0.4342
11	0.4407	0.5567	0.5367	0.4091
12	0.4219	0.5315	0.5135	0.4012
13	0.4035	0.5126	0.5008	0.3840
14	0.3868	0.5020	0.4845	0.3637
15	0.3682	0.4868	0.4694	0.3566
16	0.3514	0.4723	0.4497	0.3477
17	0.3341	0.4598	0.4296	0.3369
18	0.3205	0.4455	0.4124	0.3309
19	0.3083	0.4287	0.4012	0.3224
20	0.2971	0.4175	0.3883	0.3141
21	0.2892	0.4041	0.3753	0.3066
22	0.2808	0.3935	0.3666	0.3044
23	0.2721	0.3849	0.3565	0.3051
24	0.2650	0.3756	0.3461	0.3071
25	0.2569	0.3652	0.3372	0.3079
26	0.2493	0.3555	0.3284	0.3059
27	0.2441	0.3465	0.3204	0.3026
28	0.2383	0.3372	0.3133	0.2980
29	0.2337	0.3280	0.3061	0.2941
30	0.2282	0.3208	0.2990	0.2939
31	0.2229	0.3127	0.2914	0.2917
32	0.2176	0.3044	0.2838	0.2883
33	0.2133	0.2978	0.2765	0.2860
34	0.2086	0.2910	0.2696	0.2832
35	0.2041	0.2841	0.2634	0.2797
36	0.1996	0.2785	0.2571	0.2757
37	0.1957	0.2728	0.2521	0.2781
38	0.1926	0.2674	0.2469	0.2798
39	0.1897	0.2628	0.2418	0.2798
40	0.1866	0.2592	0.2390	0.2787
41	0.1838	0.2562	0.2357	0.2770
42	0.1807	0.2541	0.2355	0.2755
43	0.1775	0.2558	0.2344	0.2753
44	0.1745	0.2646	0.2390	0.2824
45	0.1715	0.2715	0.2429	0.2936
46	0.1684	0.2985	0.2464	0.3151
47	0.1656	0.0000	0.0000	0.3465
48	0.1629	0.0000	0.0000	0.3799
49	0.1601	0.0000	0.0000	0.4103

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1968 (Cont'd)

N*	EQUITY	EXPORTS	NET ASSETS	NET CASH FLOW
2	0.9503	0.6178	0.9754	1.0667
3	0.9603	0.6120	0.8377	0.9048
4	0.7763	0.5192	0.7303	0.6594
5	0.8630	0.4164	0.6475	0.6041
6	0.7833	0.3502	0.7086	0.6158
7	0.6908	0.2954	0.6943	0.6069
8	0.6104	0.3181	0.6887	0.5881
9	0.5550	0.3109	0.6510	0.5489
10	0.5006	0.2935	0.6022	0.5219
11	0.4680	0.2804	0.5877	0.4874
12	0.4432	0.2665	0.5652	0.4774
13	0.4154	0.2565	0.5614	0.4668
14	0.4010	0.2442	0.5469	0.4554
15	0.3933	0.2312	0.5323	0.4407
16	0.3792	0.2181	0.5174	0.4730
17	0.3669	0.2161	0.4986	0.4049
18	0.3651	0.2125	0.4808	0.3881
19	0.3575	0.2085	0.4656	0.3751
20	0.3487	0.2069	0.4514	0.3603
21	0.3380	0.2065	0.4416	0.3454
22	0.3270	0.2048	0.4300	0.3306
23	0.3230	0.2029	0.4166	0.3217
24	0.3164	0.2055	0.4047	0.3122
25	0.3093	0.2052	0.3929	0.3045
26	0.3036	0.2066	0.3858	0.2975
27	0.2990	0.2059	0.3775	0.2920
28	0.2934	0.2043	0.3681	0.2865
29	0.2881	0.2040	0.3589	0.2804
30	0.2823	0.2103	0.3503	0.2737
31	0.2760	0.2155	0.3426	0.2681
32	0.2699	0.2192	0.3339	0.2627
33	0.2647	0.2210	0.3266	0.2571
34	0.2595	0.2244	0.3207	0.2518
35	0.2575	0.2250	0.3143	0.2466
36	0.2553	0.2288	0.3080	0.2419
37	0.2528	0.2317	0.3019	0.2371
38	0.2496	0.2397	0.2957	0.2328
39	0.2483	0.2451	0.2894	0.2288
40	0.2466	0.2496	0.2840	0.2249
41	0.2461	0.2527	0.2794	0.2210
42	0.2454	0.2575	0.2750	0.2217
43	0.2445	0.2799	0.2717	0.2226
44	0.2435	0.2995	0.2707	0.2225
45	0.2434	0.3347	0.2709	0.2240
46	0.2461	0.3853	0.2700	0.2276
47	0.2512	0.0000	0.2869	0.0000
48	0.2649	0.0000	0.3226	0.0000
49	0.2903	0.0000	0.3553	0.0000

TABLE 41 COMPLETE LISTING OF LINDA CURVES FOR 1969

N*	TURNOVER	NET PROFIT	CASH FLOW	GROSS INVESTMENT
2	0.8808	1.4254	1.2285	1.9392
3	0.8559	1.0085	1.0427	1.2074
4	0.6694	0.7743	0.7608	1.0604
5	0.6944	0.6643	0.6137	1.0540
6	0.6524	0.6364	0.6220	0.9980
7	0.5963	0.6190	0.6549	0.9434
8	0.5438	0.6044	0.6249	0.8665
9	0.4950	0.5711	0.6072	0.7932
10	0.4609	0.5310	0.5790	0.7170
11	0.4236	0.5057	0.5450	0.6665
12	0.3877	0.4762	0.5200	0.6447
13	0.3810	0.4622	0.4957	0.6147
14	0.3712	0.4403	0.4684	0.5927
15	0.3560	0.4203	0.4404	0.5943
16	0.3401	0.4003	0.4156	0.5816
17	0.3273	0.3800	0.3957	0.5710
18	0.3140	0.3652	0.3767	0.5585
19	0.3020	0.3492	0.3580	0.5473
20	0.2901	0.3350	0.3464	0.5389
21	0.2796	0.3254	0.3367	0.5310
22	0.2703	0.3141	0.3253	0.5244
23	0.2604	0.3088	0.3166	0.5145
24	0.2528	0.3020	0.3090	0.5077
25	0.2455	0.2940	0.3011	0.5047
26	0.2399	0.2860	0.2931	0.4980
27	0.2337	0.2786	0.2865	0.4918
28	0.2309	0.2745	0.2798	0.4874
29	0.2277	0.2700	0.2732	0.4803
30	0.2241	0.2646	0.2674	0.4729
31	0.2206	0.2592	0.2617	0.4662
32	0.2165	0.2538	0.2547	0.4503
33	0.2121	0.2484	0.2492	0.4532
34	0.2089	0.2426	0.2435	0.4482
35	0.2052	0.2375	0.2396	0.4430
36	0.2021	0.2346	0.2358	0.4397
37	0.1993	0.2311	0.2318	0.4372
38	0.1961	0.2284	0.2276	0.4345
39	0.1927	0.2259	0.2247	0.4357
40	0.1897	0.2241	0.2220	0.4343
41	0.1869	0.2228	0.2193	0.4318
42	0.1845	0.2289	0.2183	0.4310
43	0.1820	0.2353	0.2194	0.4286
44	0.1792	0.2405	0.2196	0.4281
45	0.1767	0.2455	0.2201	0.4278
46	0.1742	0.2511	0.2221	0.4294
47	0.1718	0.2588	0.2245	0.4359
48	0.1694	0.2725	0.2281	0.4476
49	0.1671	0.2971	0.2378	0.4570
50	0.1648	0.0000	0.0000	0.4668
51	0.1628	0.0000	0.0000	0.5015
52	0.1606	0.0000	0.0000	0.5665

TABLE 4: COMPLETE LISTING OF LINDA.CURVES FOR 1969 (Cont'd)

N*	EQUITY	EXPORTS	NET ASSETS	NET CASH FLOW
2	1.0427	0.8497	1.1931	1.2759
3	0.9953	0.7759	0.9941	1.0375
4	0.7534	0.5854	0.7420	0.7865
5	0.7504	0.4753	0.6883	0.6056
6	0.7394	0.3984	0.7277	0.6206
7	0.6668	0.3591	0.7044	0.6488
8	0.5973	0.3862	0.7003	0.6201
9	0.5438	0.3827	0.6621	0.6032
10	0.5015	0.3647	0.6280	0.5810
11	0.4794	0.3469	0.6167	0.5501
12	0.4544	0.3415	0.5909	0.5304
13	0.4349	0.3277	0.5619	0.5059
14	0.4142	0.3107	0.5327	0.4773
15	0.3916	0.3003	0.5202	0.4516
16	0.3802	0.2889	0.5044	0.4270
17	0.3657	0.2765	0.4870	0.4092
18	0.3509	0.2641	0.4748	0.3901
19	0.3359	0.2530	0.4628	0.3714
20	0.3235	0.2427	0.4484	0.3548
21	0.3130	0.2327	0.4382	0.3388
22	0.3097	0.2244	0.4260	0.3291
23	0.3014	0.2192	0.4153	0.3185
24	0.2965	0.2120	0.4030	0.3086
25	0.2893	0.2070	0.3917	0.3004
26	0.2842	0.2040	0.3818	0.2942
27	0.2780	0.2032	0.3731	0.2887
28	0.2711	0.2021	0.3658	0.2820
29	0.2644	0.2000	0.3579	0.2758
30	0.2579	0.1969	0.3500	0.2692
31	0.2536	0.1938	0.3420	0.2635
32	0.2487	0.1903	0.3338	0.2580
33	0.2438	0.1899	0.3253	0.2521
34	0.2386	0.1907	0.3171	0.2461
35	0.2333	0.1917	0.3109	0.2405
36	0.2283	0.1941	0.3046	0.2364
37	0.2238	0.1960	0.2981	0.2321
38	0.2198	0.1966	0.2931	0.2280
39	0.2160	0.2008	0.2883	0.2247
40	0.2153	0.2034	0.2831	0.2211
41	0.2138	0.2053	0.2783	0.2173
42	0.2125	0.2096	0.2734	0.2146
43	0.2116	0.2127	0.2686	0.2117
44	0.2099	0.2156	0.2640	0.2110
45	0.2102	0.2215	0.2592	0.2100
46	0.2090	0.2261	0.2545	0.2111
47	0.2096	0.2309	0.2509	0.2114
48	0.2092	0.2362	0.2483	0.2116
49	0.2141	0.2482	0.2457	0.2254
50	0.2178	0.2677	0.2469	0.0000
51	0.2231	0.0000	0.2522	0.0000
52	0.2361	0.0000	0.2654	0.0000

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1970

N*	TURNOVER	NET PROFIT	CASH FLOW	GROSS INVESTMENT
2	0.9820	1.2822	1.2068	2.1878
3	0.9000	0.9382	1.0349	1.8344
4	0.7156	0.8144	0.8103	1.2952
5	0.8047	0.9547	0.9545	1.0250
6	0.7401	0.9356	1.0129	0.8790
7	0.6612	0.9083	0.9604	0.7979
8	0.5929	0.8546	0.8758	0.7306
9	0.5578	0.7865	0.8236	0.6564
10	0.5141	0.7240	0.7619	0.6031
11	0.4778	0.6608	0.7033	0.5603
12	0.4462	0.6055	0.6455	0.5299
13	0.4162	0.5627	0.5993	0.5018
14	0.3948	0.5358	0.5575	0.4794
15	0.3743	0.5083	0.5219	0.4551
16	0.3529	0.4798	0.4942	0.4530
17	0.3331	0.4630	0.4670	0.4521
18	0.3166	0.4428	0.4422	0.4515
19	0.3001	0.4241	0.4192	0.4447
20	0.2845	0.4097	0.4006	0.4379
21	0.2774	0.3961	0.3836	0.4285
22	0.2693	0.3815	0.3671	0.4220
23	0.2614	0.3666	0.3509	0.4136
24	0.2534	0.3528	0.3355	0.4057
25	0.2450	0.3441	0.3214	0.3962
26	0.2386	0.3367	0.3114	0.3861
27	0.2337	0.3309	0.3010	0.3764
28	0.2288	0.3238	0.2922	0.3676
29	0.2238	0.3160	0.2844	0.3588
30	0.2194	0.3080	0.2765	0.3501
31	0.2150	0.2998	0.2688	0.3413
32	0.2112	0.2917	0.2625	0.3431
33	0.2072	0.2852	0.2559	0.3420
34	0.2042	0.2792	0.2504	0.3400
35	0.2008	0.2739	0.2447	0.3370
36	0.1971	0.2698	0.2392	0.3335
37	0.1939	0.2721	0.2348	0.3309
38	0.1909	0.2722	0.2330	0.3285
39	0.1887	0.2800	0.2311	0.3306
40	0.1861	0.2922	0.2319	0.3315
41	0.1834	0.3024	0.2320	0.3322
42	0.1817	0.3244	0.2320	0.3329
43	0.1797	0.3682	0.2330	0.3413
44	0.1775	0.4850	0.2379	0.3489
45	0.1752	0.6249	0.2458	0.3586
46	0.1731	0.0000	0.2574	0.3656
47	0.1708	0.0000	0.2684	0.3736
48	0.1691	0.0000	0.2879	0.3855
49	0.1672	0.0000	0.3042	0.4062
50	0.1652	0.0000	0.3428	0.4293
51	0.1639	0.0000	0.0000	0.4764
52	0.1645	0.0000	0.0000	0.5241

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1970 (Cont'd)

N*	EQUITY	EXPORTS	NET ASSETS	NET CASH FLOW
2	1.1165	0.9077	1.3618	1.1979
3	0.9956	0.7916	1.1426	0.9604
4	0.7550	0.6228	0.9007	0.7262
5	0.6977	0.5033	0.8206	0.8699
6	0.7201	0.4561	0.7612	0.9379
7	0.6741	0.4033	0.7549	0.8912
8	0.6228	0.3683	0.7337	0.8115
9	0.5653	0.3650	0.7103	0.7337
10	0.5337	0.3474	0.6638	0.7013
11	0.5179	0.3457	0.6509	0.6562
12	0.5014	0.3337	0.6221	0.6137
13	0.4756	0.3170	0.5906	0.5705
14	0.4536	0.3079	0.5571	0.5304
15	0.4295	0.2944	0.5231	0.4928
16	0.4067	0.2830	0.4946	0.4591
17	0.3895	0.2733	0.4675	0.4285
18	0.3709	0.2650	0.4538	0.4037
19	0.3529	0.2582	0.4373	0.3878
20	0.3361	0.2506	0.4259	0.3705
21	0.3204	0.2419	0.4134	0.3541
22	0.3103	0.2357	0.4056	0.3385
23	0.3030	0.2294	0.3952	0.3239
24	0.2947	0.2233	0.3857	0.3119
25	0.2867	0.2212	0.3774	0.2998
26	0.2790	0.2178	0.3699	0.2880
27	0.2752	0.2141	0.3632	0.2781
28	0.2707	0.2099	0.3550	0.2717
29	0.2651	0.2063	0.3461	0.2646
30	0.2590	0.2024	0.3386	0.2572
31	0.2526	0.1980	0.3308	0.2505
32	0.2477	0.1962	0.3238	0.2439
33	0.2428	0.1946	0.3169	0.2373
34	0.2383	0.1964	0.3098	0.2315
35	0.2334	0.1970	0.3032	0.2263
36	0.2293	0.1987	0.2973	0.2214
37	0.2249	0.1999	0.2933	0.2180
38	0.2222	0.1990	0.2888	0.2143
39	0.2189	0.2020	0.2839	0.2120
40	0.2173	0.2038	0.2788	0.2101
41	0.2157	0.2045	0.2743	0.2076
42	0.2143	0.2058	0.2708	0.2056
43	0.2122	0.2077	0.2670	0.2066
44	0.2100	0.2085	0.2632	0.2074
45	0.2080	0.2090	0.2594	0.2127
46	0.2075	0.2112	0.2556	0.2181
47	0.2069	0.2129	0.2520	0.2271
48	0.2078	0.2146	0.2483	0.2391
49	0.2093	0.2187	0.2475	0.2623
50	0.2163	0.2274	0.2462	0.2880
51	0.2230	0.0000	0.2490	0.0000
52	0.2365	0.0000	0.2631	0.0000

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1971

N*	TURNOVER	NET PROFIT	CASH FLOW	GROSS INVESTMENT
2	0.9309	1.3945	1.3023	0.5251
3	0.5731	1.0564	0.8830	0.3956
4	0.8892	0.7634	0.7317	0.6019
5	0.8561	0.8919	0.9131	0.5748
6	0.8308	0.9157	0.9093	0.6082
7	0.7494	0.8468	0.8650	0.5702
8	0.6620	0.7927	0.8114	0.5162
9	0.5982	0.7389	0.7530	0.4702
10	0.5385	0.6775	0.6893	0.4525
11	0.4963	0.6237	0.6328	0.4232
12	0.4568	0.5802	0.5909	0.4013
13	0.4254	0.5434	0.5585	0.3779
14	0.4008	0.5063	0.5256	0.3700
15	0.3785	0.4736	0.4930	0.3552
16	0.3656	0.4452	0.4661	0.3425
17	0.3506	0.4181	0.4398	0.3276
18	0.3381	0.3944	0.4140	0.3127
19	0.3296	0.3829	0.3935	0.3011
20	0.3194	0.3711	0.3781	0.2943
21	0.3083	0.3579	0.3647	0.2866
22	0.2998	0.3486	0.3531	0.2783
23	0.2910	0.3435	0.3414	0.2694
24	0.2831	0.3375	0.3297	0.2607
25	0.2758	0.3298	0.3179	0.2520
26	0.2679	0.3246	0.3146	0.2445
27	0.2600	0.3184	0.3088	0.2370
28	0.2527	0.3119	0.3054	0.2295
29	0.2464	0.3047	0.3010	0.2232
30	0.2401	0.2996	0.2960	0.2166
31	0.2341	0.2945	0.2903	0.2110
32	0.2278	0.2900	0.2848	0.2064
33	0.2219	0.2867	0.2802	0.2029
34	0.2162	0.2844	0.2753	0.1996
35	0.2126	0.2817	0.2699	0.1965
36	0.2086	0.2820	0.2653	0.1935
37	0.2045	0.2807	0.2620	0.1913
38	0.2010	0.2796	0.2586	0.1895
39	0.1974	0.2780	0.2560	0.1875
40	0.1942	0.2785	0.2544	0.1882
41	0.1919	0.2788	0.2548	0.1895
42	0.1892	0.2831	0.2549	0.1921
43	0.1869	0.2890	0.2545	0.1935
44	0.1843	0.2987	0.2531	0.1966
45	0.1819	0.3055	0.2531	0.2008
46	0.1797	0.3113	0.2539	0.2067
47	0.1776	0.3298	0.2554	0.2128
48	0.1758	0.3473	0.2584	0.2189
49	0.1751	0.0000	0.2609	0.2292
50	0.1743	0.0000	0.0000	0.2373
51	0.1737	0.0000	0.0000	0.2491
52	0.1729	0.0000	0.0000	0.2939

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1971 (Cont'd)

N*	EQUITY	EXPORTS	NET ASSETS	NET CASH FLOW
2	1.0623	0.7160	1.2836	1.4038
3	0.6355	0.5119	0.7537	1.0728
4	0.7598	0.4534	0.8923	0.7809
5	0.8642	0.3856	0.9426	0.9112
6	0.8670	0.3317	0.9479	0.8438
7	0.7878	0.3893	0.9059	0.7824
8	0.7089	0.3922	0.8336	0.7437
9	0.6460	0.3783	0.7857	0.6802
10	0.6132	0.3713	0.7282	0.6224
11	0.5911	0.3679	0.6807	0.5679
12	0.5572	0.3560	0.6555	0.5316
13	0.5204	0.3499	0.6207	0.4945
14	0.4850	0.3390	0.5845	0.4664
15	0.4579	0.3304	0.5534	0.4414
16	0.4353	0.3179	0.5254	0.4160
17	0.4126	0.3094	0.4957	0.3960
18	0.3910	0.3037	0.4745	0.3761
19	0.3757	0.3010	0.4551	0.3574
20	0.3599	0.2953	0.4461	0.3398
21	0.3449	0.2900	0.4339	0.3240
22	0.3346	0.2833	0.4232	0.3094
23	0.3235	0.2753	0.4106	0.2980
24	0.3146	0 2679	0.3980	0.2865
25	0.3058	0.2604	0.3877	0.2807
26	0.2982	0.2533	0.3768	0.2784
27	0.2929	0.2458	0.3701	0.2744
28	0.2870	0.2391	0.3630	0.2690
29	0.2802	0.2336	0.3556	0.2631
30	0.2742	0.2303	0.3498	0.2570
31	0.2677	0.2292	0.3413	0.2526
32	0.2615	0.2286	0.3341	0.2489
33	0.2550	0.2270	0.3265	0.2446
34	0.2508	0.2251	0.3189	0.2403
35	0.2462	0.2266	0.3122	0.2360
36	0.2413	0.2277	0.3067	0.2319
37	0.2369	0.2276	0.3007	0.2277
38	0.2328	0.2272	0.2952	0.2237
39	0.2285	0.2262	0.2894	0.2202
40	0.2245	0.2248	0.2835	0.2201
41	0.2208	0.2245	0.2775	0.2188
42	0.2183	0.2265	0.2723	0.2168
43	0.2157	0.2279	0.2683	0.2151
44	0.2128	0.2283	0.2638	0.2136
45	0.2105	0.2330	0.2597	0.2126
46	0.2088	0.2308	0.2555	0.2124
47	0.2079	0.2483	0.2511	0.2133
48	0.2113	0.2752	0.2468	0.2182
49	0.2194	0.3155	0.2437	0.2334
50	0.2259	0.9338	0.2495	0.0000
51	0.2398	2.2152	0.2587	0.0000
52	0.2522	0.0000	0.2685	0.0000

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1972

N*	TURNOVER	NET PROFIT	CASH FLOW	GROSS INVESTMENT
2	0.9565	1.5432	1.3904	0.5082
3	0.6314	1.1912	0.9743	0.3556
4	0.6826	0.8653	0.8214	0.5235
5	0.7751	0.7702	0.7721	0.5536
6	0.7940	0.7442	0.7511	0.5462
7	0.7362	0.6804	0.7028	0.5029
8	0.6631	0.6337	0.6671	0.4948
9	0.5964	0.5892	0.6379	0.4608
10	0.5394	0.5765	0.6083	0.4323
11	0.5084	0.5472	0.5753	0.4246
12	0.4753	0.5231	0.5572	0.4178
13	0.4445	0.5042	0.5295	0.4025
14	0.4186	0.4842	0.5000	0.3880
15	0.3990	0.4597	0.4704	0.3702
16	0.3790	0.4348	0.4437	0.3511
17	0.3579	0.4122	0.4211	0.3341
18	0.3436	0.3918	0.3991	0.3228
19	0.3294	0.3715	0.3777	0.3103
20	0.3165	0.3535	0.3583	0.3021
21	0.3054	0.3442	0.3469	0.2927
22	0.2941	0.3335	0.3351	0.2830
23	0.2853	0.3265	0.3257	0.2764
24	0.2764	0.3210	0.3156	0.2694
25	0.2672	0.3148	0.3057	0.2647
26	0.2600	0.3080	0.2971	0.2588
27	0.2525	0.3009	0.2880	0.2525
28	0.2452	0.2934	0.2814	0.2459
29	0.2391	0.2855	0.2766	0.2397
30	0.2329	0.2811	0.2714	0.2336
31	0.2266	0.2758	0.2665	0.2282
32	0.2225	0.2703	0.2617	0.2256
33	0.2182	0.2659	0.2563	0.2255
34	0.2142	0.2621	0.2523	0.2269
35	0.2100	0.2577	0.2502	0.2267
36	0.2056	0.2548	0.2470	0.2272
37	0.2017	0.2522	0.2444	0.2268
38	0.1978	0.2489	0.2413	0.2268
39	0.1943	0.2463	0.2378	0.2273
40	0.1916	0.2444	0.2349	0.2268
41	0.1886	0.2418	0.2321	0.2262
42	0.1855	0.2417	0.2290	0.2252
43	0.1829	0.2405	0.2265	0.2258
44	0.1806	0.2408	0.2253	0.2257
45	0.1784	0.2406	0.2242	0.2306
46	0.1765	0.2411	0.2240	0.2337
47	0.1743	0.2445	0.2241	0.2372
48	0.1720	0.2479	0.2261	0.2422
49	0.1703	0.2599	0.2287	0.2458
50	0.1693	0.4975	0.2311	0.2572
51	0.1682	0.0000	0.2498	0.2749
52	0.1687	0.0000	0.2654	0.3215
53	0.1759	0.0000	0.0000	0.3599

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1972 (Cont'd)

N*	EQUITY	EXPORTS	NET ASSETS	NET CASH FLOW
2	1.0955	0.5542	1.0587	1.6202
3	0.6479	0.4153	0.6986	1.0062
4	0.7191	0.3716	0.9128	0.7934
5	0.7813	0.3297	0.9683	0.7117
6	0.7953	0.3576	0.9875	0.6788
7	0.7277	0.4589	0.9067	0.6498
8	0.6805	0.4111	0.8543	0.6177
9	0.6235	0.3916	0.7802	0.5382
10	0.5921	0.3740	0.7203	0.5620
11	0.5542	0.3458	0.6727	0.5253
12	0.5322	0.3371	0.6523	0.4957
13	0.5075	0.3491	0.6230	0.4740
14	0.4819	0.3389	0.5885	0.4515
15	0.4572	0.3309	0.5606	0.4281
16	0.4323	0.3219	0.5351	0.4039
17	0.4061	0.3108	0.5062	0.3811
18	0.3863	0.2983	0.4833	0.3633
19	0.3705	0.2865	0.4638	0.3458
20	0.3603	0.2771	0.4502	0.3305
21	0.3463	0.2683	0.4377	0.3210
22	0.3381	0.2591	0.4256	0.3115
23	0.3274	0.2529	0.4121	0.3016
24	0.3178	0.2458	0.3991	0.2923
25	0.3107	0.2414	0.3864	0.2829
26	0.3023	0.2375	0.3735	0.2739
27	0.2979	0.2329	0.3621	0.2651
28	0.2915	0.2283	0.3522	0.2599
29	0.2854	0.2237	0.3436	0.2557
30	0.2808	0.2205	0.3369	0.2505
31	0.2746	0.2144	0.3292	0.2450
32	0.2689	0.2128	0.3212	0.2408
33	0.2628	0.2092	0.3130	0.2361
34	0.2569	0.2060	0.3056	0.2334
35	0.2511	0.2038	0.2979	0.2309
36	0.2462	0.2026	0.2906	0.2279
37	0.2420	0.2018	0.2844	0.2247
38	0.2370	0.2006	0.2782	0.2215
39	0.2330	0.1993	0.2724	0.2183
40	0.2290	0.2014	0.2674	0.2148
41	0.2260	0.2029	0.2624	0.2113
42	0.2231	0.2037	0.2575	0.2078
43	0.2228	0.2036	0.2533	0.2050
44	0.2202	0.2034	0.2498	0.2032
45	0.2180	0.2050	0.2461	0.2017
46	0.2159	0.2071	0.2427	0.1996
47	0.2200	0.2163	0.2392	0.1995
48	0.2284	0.2305	0.2366	0.1987
49	0.2343	0.2615	0.2338	0.1992
50	0.2417	0.3035	0.2316	0.2013
51	0.2486	0.6574	0.2426	0.2135
52	0.2634	0.0000	0.2537	0.0000
53	0.0000	0.0000	0.2630	0.0000

TABLE 4, COMPLETE LISTING OF LINDA CURVES FOR 1973

N*	TURNOVER	NET PROFIT	CASH FLOW	GROSS INVESTMENT
2	0.9633	1.4765	1.3489	0.5917
3	0.6325	1.0918	0.9406	0.4097
4	0.6723	0.8336	0.7869	0.3366
5	0.6530	0.8308	0.8147	0.3459
6	0.6908	0.7516	0.7456	0.4237
7	0.6450	0.7220	0.7268	0.4377
8	0.5800	0.6637	0.6700	0.4180
9	0.5504	0.6387	0.6518	0.4251
10	0.5214	0.6222	0.6352	0.4206
11	0.4870	0.5966	0.6016	0.4009
12	0.4642	0.5802	0.5815	0.3895
13	0.4373	0.5519	0.5556	0.3739
14	0.4095	0.5216	0.5302	0.3607
15	0.3831	0.4966	0.5038	0.3448
16	0.3625	0.4756	0.4794	0.3286
17	0.3438	0.4534	0.4561	0.3154
18	0.3277	0.4370	0.4341	0.3035
19	0.3116	0.4209	0.4148	0.2932
20	0.3055	0.4041	0.3991	0.2897
21	0.2964	0.3883	0.3856	0.2831
22	0.2884	0.3785	0.3723	0.2765
23	0.2801	0.3689	0.3634	0.2697
24	0.2718	0.3610	0.3542	0.2626
25	0.2630	0.3568	0.3472	0.2564
26	0.2548	0.3518	0.3397	0.2506
27	0.2490	0.3453	0.3330	0.2473
28	0.2440	0.3375	0.3260	0.2437
29	0.2395	0.3305	0.3185	0.2391
30	0.2345	0.3248	0.3107	0.2351
31	0.2299	0.3191	0.3027	0.2315
32	0.2256	0.3129	0.2951	0.2278
33	0.2210	0.3087	0.2896	0.2236
34	0.2162	0.3048	0.2836	0.2195
35	0.2121	0.3000	0.2787	0.2151
36	0.2078	0.2953	0.2752	0.2120
37	0.2035	0.2903	0.2710	0.2093
38	0.1993	0.2852	0.2663	0.2062
39	0.1949	0.2799	0.2620	0.2030
40	0.1914	0.2749	0.2581	0.2005
41	0.1881	0.2714	0.2537	0.2050
42	0.1847	0.2674	0.2492	0.2077
43	0.1817	0.2636	0.2448	0.2095
44	0.1784	0.2604	0.2410	0.2112
45	0.1754	0.2614	0.2386	0.2135
46	0.1734	0.2609	0.2371	0.2168
47	0.1713	0.2600	0.2340	0.2192
48	0.1691	0.2598	0.2335	0.2236
49	0.1660	0.2599	0.2319	0.2264
50	0.1651	0.2598	0.2308	0.2297
51	0.1631	0.2608	0.2296	0.2330
52	0.1624	0.2637	0.2292	0.2395
53	0.1630	0.2759	0.2283	0.2447
54	0.1638	0.2910	0.2280	0.2488
55	0.1716	0.3065	0.2274	0.2522

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1973 (Cont'd)

N*	EQUITY	EXPORTS	NET ASSETS	NET CASH FLOW
2	1.0657	0.6070	1.2444	1.3748
3	0.6660	0.4830	0.7164	0.8408
4	0.7317	0.4122	0.6568	0.7131
5	0.6873	0.3460	0.7481	0.7900
6	0.7516	0.4412	0.8151	0.7297
7	0.7051	0.4424	0.8165	0.7026
8	0.6559	0.4513	0.7582	0.6610
9	0.6040	0.4383	0.7081	0.6414
10	0.5567	0.4136	0.6707	0.6244
11	0.5286	0.3890	0.6455	0.5932
12	0.5041	0.3641	0.6372	0.5564
13	0.4911	0.3413	0.6182	0.5221
14	0.4709	0.3234	0.5934	0.5034
15	0.4494	0.3047	0.5641	0.4807
16	0.4314	0.2920	0.5370	0.4574
17	0.4180	0.2784	0.5139	0.4427
18	0.4094	0.2707	0.4902	0.4266
19	0.3969	0.2613	0.4707	0.4094
20	0.3834	0.2511	0.4526	0.3922
21	0.3701	0.2423	0.4392	0.3754
22	0.3593	0.2341	0.4307	0.3646
23	0.3474	0.2288	0.4214	0.3557
24	0.3375	0.2237	0.4110	0.3495
25	0.3279	0.2215	0.4001	0.3420
26	0.3198	0.2180	0.3891	0.3333
27	0.3108	0.2136	0.3787	0.3245
28	0.3030	0.2088	0.3678	0.3169
29	0.2961	0.2052	0.3573	0.3092
30	0.2895	0.2010	0.3479	0.3016
31	0.2824	0.1985	0.3369	0.2937
32	0.2769	0.1988	0.3280	0.2861
33	0.2708	0.2011	0.3190	0.2799
34	0.2651	0.2023	0.3102	0.2735
35	0.2612	0.2027	0.3015	0.2680
36	0.2566	0.2028	0.2930	0.2631
37	0.2518	0.2032	0.2859	0.2580
38	0.2468	0.2028	0.2790	0.2527
39	0.2421	0.2023	0.2724	0.2483
40	0.2373	0.2020	0.2659	0.2435
41	0.2324	0.2025	0.2608	0.2398
42	0.2293	0.2022	0.2570	0.2369
43	0.2278	0.2026	0.2526	0.2341
44	0.2258	0.2033	0.2490	0.2315
45	0.2244	0.2049	0.2452	0.2291
46	0.2230	0.2071	0.2414	0.2268
47	0.2213	0.2120	0.2381	0.2242
48	0.2192	0.2169	0.2345	0.2215
49	0.2198	0.2312	0.2317	0.2190
50	0.2199	0.2453	0.2301	0.2175
51	0.2237	0.2687	0.2285	0.2160
52	0.2261	0.3362	0.2272	0.2141
53	0.2349	0.6438	0.2305	0.2136
54	0.2420	0.0000	0.2351	0.2125
55	0.2568	0.0000	0.2478	0.2138

APPENDIX B

TABLES OF CONCENTRATION

ECONOMIC ACTIVITY UNITS

T E X T I L E S (parts)

Data relate to firms of combined activities
in the following sub-sectors

WOOL (NICE 231)

COTTON (NICE 232)

HOSIERY AND OTHER KNITTED GOODS (NICE 233)

together with vertically integrated
finishing activities.

TABLE 1: TOTAL VALUES OF THE SAMPLE 1968-73 (N* = number of positive values)

	VARIABLE 01: TURNOVER			VARIABLE 04: NET PROFIT BEFORE TAX		
	N*	£000	1968=100	N*	£000	1968=100
1968	50	911,604	100	48	57,266	100
1969	54	1,030,811	113	52	52,667	92
1970	54	1,034,288	113	48	43,602	76
1971	55	1,151,726	127	51	57,864	101
1972	56	1,269,044	140	53	84,383	147
1973	58	1,543,646	163	58	111,393	195

TABLE 2: MEASURES OF CONCENTRATION

VARIABLE 01: TURNOVER

	N*	MEAN	V	GINI	H-H	ENTROPY
1968	50	18,232	1.937	0.6266	95.0	-132.5
1969	54	19,089	1.947	0.6299	88.7	-135.8
1970	54	19,153	1.843	0.616	81.5	-138.0
1971	55	20,941	2.145	0.6533	101.8	-131.9
1972	56	22,662	2.061	0.6357	93.7	-135.3
1973	58	26,607	2,089	0.6365	92.5	-136.8

VARIABLE 04: NET PROFIT BEFORE TAX

1968	47	1,218	1.729	0.6458	84.9	-130.8
1969	52	1,013	1.727	0.6306	76.6	-137.1
1970	48	908	1.816	0.6358	89.6	-131.4
1971	51	1,135	1.808	0.6397	83.7	-134.4
1972	53	1,592	1.651	0.6226	70.3	-139.3
1973	58	1,921	1.790	0.6578	72.5	-138.6

Note: The mean figures are in thousands of pounds; definitions of the four concentration measures are given on page

TABLE 3: LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

VARIABLE 01: TURNOVER

N*		1968	1969	1970	1971	1972	1973
4	L	0.576	0.587	0.550	0.590	0.597	0.643
	CR	49,8	48.9	47.6	54.9	51.4	49.4
8	L	0.436	0.456	0.428	0.574	0.527	0.490
	CR	66.2	63.7	62.5	65.3	63.9	63.2
10	L	0.400	0.401	0.404	0.487	0.452	0.445
	CR	70.4	68.0	66.3	69.2	67.9	67.0
12	L	0.359	0.344	0.360	0.420	0.403	0.390
	CR	74.0	72.0	69.8	72.6	71.1	70.4
20	L	0.275	0.261	0.238	0.291	0.278	0.266
	CR	83.4	81.8	80.9	82.7	81.1	80.6
30	L	0.218	0.201	0.183	0.224	0.209	0.207
	CR	90.9	90.1	89.7	90.1	89.0	88.6
40	L	0.183	0.179	0.165	0.188	0.175	0.174
	CR	95.9	94.9	94.9	95.2	94.3	93.8

SUMMARY COEFFICIENTS OF LINDA CURVES

1st Maximum	L	1.461	1.119	1.009	1.032	1.167	1.249
	CR	33.6	34.2	32.7	37.9	35.2	34.6
	N*H<	2	2	2	2	2	2
Overall Maximum	L						
	CR						
	N*H						
1st Minimum	L	0.436	0.460	0.435	0.590	0.525	0.537
	CR	57.3	55.6	54.2	54.9	56.6	55.2
	N*M	5	5	5	4	5	5
	LS	0.822	0.749	0.585	0.773	0.752	0.800

TABLE 3: LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

VARIABLE 04: NET PROFIT

N*		1968	1969	1970	1971	1972	1973
4	L	0.482	0.567	0.483	0.463	0,453	0.452
	CR	48.4	44.5	52.9	50.4	44.3	45.0
8	L	0.338	0.335	0.475	0.448	0.318	0.318
	CR	69.2	63.6	65.1	63.5	62.5	64.1
10	L	0.324	0.320	0.414	0.391	0.314	0.310
	CR	74.0	68.3	69.4	67.8	67.3	69.2
12	L	0.319	0.300	0.357	0.338	0.314	0.300
	CR	77.6	72.1	73.3	71.8	71.1	72.7
20	L	0.282	0.229	0.255	0.230	0.217	0.235
	CR	86.4	83.1	84.2	83.9	82.3	83.2
30	L	0.228	0.185	0.195	0.185	0.177	0.201
	CR	93.2	91.5	92.9	92.7	90.9	90.5
40	L	0.189	0.159	0.164	0.172	0.156	0.173
	CR	98.2	97.1	99.0	97.7	96.5	95.4

SUMMARY COEFFICIENTS OF LINDA CURVES

1st Maximum	L	1.047	1.074	0.854	1.013	0.981	0.981
	CR	31.0	30.3	34.9	32.3	28.1	27.8
	N*H<	2	2	2	2	2	2
Overall Maximum	L						
	CR						
	N*H						
1st Minimum	L	0.322	0.154	0.483	0.463	0.304	0.299
	CR	66.4	98.0	52.9	50.4	65.4	67.5
	N*M	7	44	4	4	9	9
	LS	0.532	0.276	0.658	0.711	0.470	0.460

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TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1968

N*	TURNOVER	NET PROFITS
2	1.4614	1.0466
3	0.8141	0.6262
4	0.5762	0.4820
5	0.4357	0.3826
6	0.4639	0.3351
7	0.4543	0.3222
8	0.4360	0.3380
9	0.4204	0.3391
10	0.3995	0.3235
11	0.3803	0.3265
12	0.3584	0.3186
13	0.3537	0.3173
14	0.3455	0.3117
15	0.3353	0.3098
16	0.3214	0.3058
17	0.3087	0.3018
18	0.2966	0.2956
19	0.2849	0.2869
20	0.2743	0.2817
21	0.2657	0.2745
22	0.2594	0.2691
23	0.2528	0.2649
24	0.2457	0.2599
25	0.2409	0.2538
26	0.2334	0.2486
27	0.2297	0.2434
28	0.2252	0.2379
29	0.2210	0.2332
30	0.2175	0.2280
31	0.2144	0.2223
32	0.2100	0.2173
33	0.2069	0.2130
34	0.2029	0.2086
35	0.1992	0.2040
36	0.1954	0.2004
37	0.1926	0.1971
38	0.1895	0.1943
39	0.1865	0.1917
40	0.1834	0.1892
41	0.1804	0.1873
42	0.1774	0.1852
43	0.1743	0.1836
44	0.1711	0.1650
45	0.1682	0.1920
46	0.1653	0.1975
47	0.1623	0.2183
48	0.1596	0.0000
49	0.1570	0.0000
50	0.1543	0.0000

EAU TEXTILES

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1969

N*	TURNOVER	NET PROFIT.
2	1.1193	1.0741
3	0.8293	0.7094
4	0.5874	0.5071
5	0.4596	0.4462
6	0.4041	0.3633
7	0.4435	0.3423
8	0.4560	0.3353
9	0.4241	0.3326
10	0.4011	0.3204
11	0.3726	0.3133
12	0.3431	0.2990
13	0.3401	0.2853
14	0.3284	0.2802
15	0.3182	0.2728
16	0.3050	0.2636
17	0.2916	0.2530
18	0.2812	0.2457
19	0.2704	0.2369
20	0.2608	0.2287
21	0.2510	0.2201
22	0.2441	0.2143
23	0.2363	0.2103
24	0.2282	0.2075
25	0.2206	0.2036
26	0.2142	0.1980
27	0.2052	0.1942
28	0.2037	0.1899
29	0.2029	0.1879
30	0.2005	0.1849
31	0.1935	0.1819
32	0.1950	0.1784
33	0.1941	0.1752
34	0.1915	0.1719
35	0.1902	0.1686
36	0.1880	0.1656
37	0.1861	0.1642
38	0.1838	0.1623
39	0.1812	0.1609
40	0.1787	0.1590
41	0.1766	0.1575
42	0.1744	0.1558
43	0.1719	0.1544
44	0.1694	0.1536
45	0.1670	0.1580
46	0.1646	0.1626
47	0.1622	0.1664
48	0.1598	0.1702
49	0.1573	0.1744
50	0.1555	0.1826
51	0.1532	0.1920
52	0.1513	0.2094
53	0.1493	0.0000
54	0.1477	0.0000

EAU TEXTILES
TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1970

N*	TURNOVER	NET PROFITS
2	1.0089	0.8541
3	0.7456	0.6385
4	0.5504	0.4925
5	0.4353	0.5486
6	0.4834	0.5132
7	0.4616	0.5038
8	0.4277	0.4747
9	0.4237	0.4461
10	0.4041	0.4138
11	0.3809	0.3853
12	0.3601	0.3566
13	0.3392	0.3353
14	0.3192	0.3203
15	0.3039	0.3049
16	0.2897	0.2905
17	0.2757	0.2831
18	0.2620	0.2727
19	0.2501	0.2628
20	0.2382	0.2545
21	0.2268	0.2477
22	0.2222	0.2398
23	0.2166	0.2314
24	0.2112	0.2236
25	0.2056	0.2176
26	0.1994	0.2124
27	0.1950	0.2070
28	0.1914	0.2024
29	0.1873	0.1991
30	0.1835	0.1951
31	0.1812	0.1908
32	0.1790	0.1863
33	0.1765	0.1818
34	0.1749	0.1773
35	0.1734	0.1738
36	0.1716	0.1705
37	0.1705	0.1673
38	0.1688	0.1643
39	0.1668	0.1622
40	0.1646	0.1639
41	0.1635	0.1659
42	0.1619	0.1711
43	0.1601	0.1785
44	0.1582	0.1851
45	0.1562	0.1991
46	0.1542	0.2267
47	0.1522	0.2998
48	0.1502	0.3879
49	0.1481	0.0000
50	0.1465	0.0000
51	0.1448	0.0000
52	0.1430	0.0000
53	0.1419	0.0000
54	0.1424	0.0000

EAU TEXTILES

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1971

N*	TURNOVER	NET PROFITS
2	1.0323	1.0131
3	0.6970	0.6568
4	0.5900	0.4632
5	0.6748	0.4875
6	0.6384	0.4715
7	0.6227	0.4574
8	0.5740	0.4476
9	0.5321	0.4165
10	0.4866	0.3912
11	0.4540	0.3629
12	0.4193	0.3381
13	0.3982	0.3196
14	0.3656	0.3012
15	0.3463	0.2833
16	0.3283	0.2673
17	0.3183	0.2545
18	0.3066	0.2423
19	0.2969	0.2368
20	0.2905	0.2299
21	0.2825	0.2221
22	0.2737	0.2155
23	0.2671	0.2095
24	0.2601	0.2043
25	0.2537	0.2019
26	0.2479	0.1989
27	0.2415	0.1950
28	0.2350	0.1907
29	0.2295	0.1880
30	0.2236	0.1849
31	0.2180	0.1817
32	0.2126	0.1794
33	0.2079	0.1773
34	0.2054	0.1755
35	0.2028	0.1743
36	0.2001	0.1738
37	0.1972	0.1729
38	0.1941	0.1718
39	0.1909	0.1722
40	0.1877	0.1717
41	0.1855	0.1714
42	0.1828	0.1709
43	0.1800	0.1716
44	0.1776	0.1723
45	0.1751	0.1755
46	0.1724	0.1793
47	0.1700	0.1822
48	0.1677	0.1882
49	0.1657	0.1929
50	0.1640	0.2056
51	0.1633	0.2176
52	0.1625	0.0000
53	0.1620	0.0000
54	0.1612	0.0000
55	0.1782	0.0000

EAU TEXTILES

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1972

N*	TURNOVER	NET PROFIT
2	1.1674	0.9813
3	0.7211	0.6326
4	0.5965	0.4527
5	0.5253	0.3818
6	0.5470	0.3523
7	0.5553	0.3399
8	0.5273	0.3179
9	0.4684	0.3040
10	0.4523	0.3135
11	0.4248	0.3051
12	0.4020	0.2919
13	0.3776	0.2847
14	0.3569	0.2756
15	0.3375	0.2647
16	0.3230	0.2553
17	0.3080	0.2444
18	0.2934	0.2355
19	0.2826	0.2257
20	0.2716	0.2167
21	0.2613	0.2120
22	0.2582	0.2369
23	0.2516	0.2013
24	0.2446	0.1975
25	0.2372	0.1933
26	0.2335	0.1905
27	0.2254	0.1874
28	0.2192	0.1845
29	0.2142	0.1811
30	0.2091	0.1772
31	0.2057	0.1731
32	0.2001	0.1703
33	0.1962	0.1677
34	0.1933	0.1648
35	0.1905	0.1639
36	0.1872	0.1622
37	0.1833	0.1603
38	0.1803	0.1589
39	0.1772	0.1579
40	0.1748	0.1564
41	0.1722	0.1550
42	0.1695	0.1535
43	0.1667	0.1526
44	0.1643	0.1513
45	0.1622	0.1510
46	0.1603	0.1512
47	0.1583	0.1522
48	0.1562	0.1534
49	0.1542	0.1546
50	0.1520	0.1569
51	0.1496	0.1595
52	0.1483	0.1678
53	0.1473	0.3269
54	0.1462	0.0000
55	0.1460	0.0000
56	0.1525	0.0000

EAU TEXTILES
TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1973

N*	TURNOVER	NET PROFIT
2	1.2431	0.9811
3	0.7727	0.5040
4	0.6421	0.4517
5	0.5707	0.3624
6	0.5044	0.3436
7	0.4815	0.3254
8	0.4711	0.3182
9	0.4298	0.2949
10	0.4007	0.3104
11	0.4504	0.3091
12	0.4255	0.3001
13	0.3933	0.2943
14	0.3717	0.2823
15	0.3470	0.2702
16	0.3273	0.2624
17	0.3124	0.2532
18	0.2963	0.2475
19	0.2877	0.2411
20	0.2790	0.2347
21	0.2707	0.2283
22	0.2610	0.2244
23	0.2553	0.2224
24	0.2455	0.2216
25	0.2371	0.2194
26	0.2293	0.2170
27	0.2237	0.2136
28	0.2135	0.2104
29	0.2143	0.2047
30	0.2110	0.2007
31	0.2073	0.1974
32	0.2052	0.1937
33	0.1994	0.1902
34	0.195	0.1883
35	0.1911	0.1863
36	0.1869	0.1841
37	0.1830	0.1816
38	0.1794	0.1783
39	0.1759	0.1759
40	0.1729	0.1731
41	0.1693	0.1706
42	0.1664	0.1673
43	0.1637	0.1654
44	0.1607	0.1633
45	0.1573	0.1612
46	0.1561	0.1596
47	0.1542	0.1600
48	0.1511	0.1602
49	0.1496	0.1601
50	0.1470	0.1605
51	0.1453	0.1613
52	0.1443	0.1613
53	0.1424	0.1624
54	0.1413	0.1644
55	0.1399	0.1731
56	0.1401	0.1837
57	0.1405	0.1940
58	0.1464	0.5584

TABLES OF CONCENTRATION

ECONOMIC ACTIVITY UNITS

SUB-SECTOR: WOOL (NICE 232) U.K.

Prepared at the Cranfield Institute of Technology, Bedford.

TABLE 1: TOTAL VALUES OF THE SAMPLE 1968-73 (N^* = number of positive values)

	VARIABLE 01: TURNOVER			VARIABLE 04: NET PROFIT BEFORE TAX		
	N^*	£000	1968=100	N^*	£000	1968=100
1968	60	315,306	100	56	16,911	100
1969	60	340,965	108	56	13,653	81
1970	60	333,823	106	50	10,181	60
1971	61	346,195	110	55	12,792	76
1972	60	398,170	126	59	25,656	151
1973	60	499,724	158	59	34,927	207

TABLE 2: MEASURES OF CONCENTRATION

VARIABLE 01: TURNOVER

	N^*	MEAN	V	GINI	H-H	ENTROPY
1968	60	5,255	1.378	0.5600	48.31	-151.7
1969	60	5,683	1.654	0.5818	62.25	-147.4
1970	60	5,564	1.609	0.5725	59.84	-148.7
1971	61	5,675	1.607	0.5829	58.74	-148.7
1972	60	6,636	1.716	0.5947	65.74	-145.9
1973	60	8,329	1.654	0.5942	62.26	-146.8

VARIABLE 04: NET PROFIT BEFORE TAX

1968						
1969	56	243.8	1.703	0.6570	69.64	-138.4
1970	50	203.6	1.242	0.5867	50.87	-143.9
1971	55	232.6	1.361	0.6031	51.84	-145.8
1972	59	434.8	1.653	0.6388	63.23	-142.7
1973	59	592.0	1.694	0.6413	65.61	-141.9

Note: The mean figures are in thousands of pounds; definitions of the four concentration measures are given on page

WOOL (EAU)

TABLE 3: LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

VARIABLE 01: TURNOVER

N*		1968	1969	1970	1971	1972	1973
4	L	0.302	0.483	0.541	0.454	0.525	0.554
	CR	35.9	41.0	39.2	40.6	43.5	41.6
8	L	0.250	0.340	0.319	0.334	0.393	0.375
	CR	54.9	56.7	55.1	55.8	56.6	55.6
10	L	0.238	0.298	0.272	0.294	0.334	0.318
	CR	60.0	62.0	60.9	61.0	61.4	60.5
12	L	0.225	0.276	0.243	0.263	0.296	0.268
	CR	64.2	66.0	65.6	65.2	65.5	65.2
20	L	0.183	0.218	0.212	0.206	0.213	0.199
	CR	75.4	76.1	75.6	75.8	76.8	76.8
30	L	0.145	0.161	0.155	0.154	0.159	0.151
	CR	84.8	85.4	85.1	85.3	86.4	86.9
40	L	0.122	0.133	0.131	0.113	0.136	0.133
	CR	91.4	91.9	91.7	92.0	92.8	93.2

SUMMARY COEFFICIENTS OF LINDA CURVES

1st Maximum	L	0.628	1.119	1.097	0.904	0.664	0.640
	CR	19.4	26.3	26.1	26.0	37.4	36.2
	N*H<	2	2	2	2	3	3
Overall Maximum	L						
	CR						
	N*H						
1st Minimum	L	0.245	0.276	0.242	0.113	0.532	0.590
	CR	48.2	66.0	68.7	99.5	31.1	29.7
	N*M	6	12	14	58	2	2
	LS	0.365	0.455	0.387	0.206	-	-

WOOL (FAU) (Cont'd)

TABLE 3: LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

VARIABLE 04: NET PROFIT BEFORE TAX

N*		1968	1969	1970	1971	1972	1973
4	L	0.348	0.442	0.293	0.461	0.504	0.399
	CR	41.4	46.0	35.9	35.4	41.7	45.1
8	L	0.285	0.382	0.237	0.254	0.289	0.332
	CR	60.0	60.4	54.5	53.1	59.5	60.7
10	L	0.293	0.328	0.204	0.205	0.261	0.308
	CR	64.3	65.4	61.2	60.7	65.8	65.6
12	L	0.273	0.281	0.176	0.185	0.255	0.277
	CR	68.2	70.0	67.5	66.5	70.0	69.7
20	L	0.188	0.178	0.146	0.150	0.207	0.207
	CR	80.9	85.3	83.8	82.3	80.8	81.6
30	L	0.148	0.182	0.138	0.144	0.162	0.175
	CR	91.3	92.6	93.4	91.6	90.2	90.0
40	L	0.147	0.167	0.147	0.142	0.146	0.155
	CR	96.6	97.3	98.2	96.7	95.8	95.3

SUMMARY COEFFICIENTS OF LINDA CURVES

1st Maximum	L	0.564	0.692	0.577	0.704	0.742	0.542
	CR	24.6	29.0	19.3	22.6	26.6	26.3
	N*H<	2	2	2	2	2	2
Overall Maximum	L						
	CR						
	N*H						
1st Minimum	L	0.281	0.178	0.252	0.142	0.473	0.355
	CR	49.2	85.3	42.8	89.5	36.7	38.9
	N*M	5	20	5	27	3	3
	LS	0.142	0.327	0.378	0.231	0.608	0.449

COMMISSION OF THE EUROPEAN COMMUNITIES

DIRECTORATE-GENERAL COMPETITION
IV/A-3

A STUDY OF THE EVOLUTION OF CONCENTRATION IN THE UNITED KINGDOM PAPER INDUSTRY

Vol. 2.

PART 2

0/75-E

EAU WOOL

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1968

N*	TURNOVER	NET PROFITS
2	0.6277	0.5635
3	0.4005	0.4544
4	0.3022	0.3483
5	0.2480	0.2814
6	0.2443	0.3083
7	0.2521	0.3025
8	0.2500	0.2852
9	0.2436	0.2919
10	0.2384	0.2932
11	0.2280	0.2833
12	0.2254	0.2727
13	0.2260	0.2588
14	0.2211	0.2463
15	0.2134	0.2341
16	0.2055	0.2238
17	0.2002	0.2128
18	0.1951	0.2029
19	0.1889	0.1943
20	0.1830	0.1883
21	0.1772	0.1820
22	0.1714	0.1757
23	0.1673	0.1700
24	0.1633	0.1643
25	0.1596	0.1588
26	0.1554	0.1575
27	0.1531	0.1556
28	0.1507	0.1529
29	0.1479	0.1497
30	0.1451	0.1480
31	0.1430	0.1461
32	0.1408	0.1451
33	0.1384	0.1449
34	0.1357	0.1447
35	0.1329	0.1445
36	0.1306	0.1442
37	0.1283	0.1450
38	0.1260	0.1465
39	0.1239	0.1471
40	0.1216	0.1470
41	0.1196	0.1470
42	0.1178	0.1464
43	0.1160	0.1455
44	0.1145	0.1445
45	0.1130	0.1438
46	0.1115	0.1442
47	0.1098	0.1464
48	0.1083	0.1481
49	0.1071	0.1510
50	0.1059	0.1590
51	0.1047	0.1656
52	0.1034	0.1716
53	0.1033	0.1762
54	0.1030	0.1853
55	0.1031	0.2106
56	0.1032	0.0000
57	0.1031	0.0000
58	0.1030	0.0000
59	0.1037	0.0000
60	0.1041	0.0000

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TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1969.

N*	TURNOVER	NET PROFIT%
2	1.1186	0.6924
3	0.6686	0.4975
4	0.4839	0.4417
5	0.4042	0.4149
6	0.3893	0.4144
7	0.3640	0.3941
8	0.3404	0.3817
9	0.3102	0.3529
10	0.2931	0.3280
11	0.2802	0.3031
12	0.2737	0.2811
13	0.2773	0.2597
14	0.2704	0.2403
15	0.2622	0.2269
16	0.2519	0.2172
17	0.2403	0.2065
18	0.2340	0.1957
19	0.2262	0.1868
20	0.2181	0.1783
21	0.2106	0.1847
22	0.2024	0.1872
23	0.1961	0.1877
24	0.1891	0.1886
25	0.1822	0.1874
26	0.1764	0.1859
27	0.1720	0.1835
28	0.1683	0.1830
29	0.1651	0.1823
30	0.1611	0.1815
31	0.1573	0.1801
32	0.1542	0.1790
33	0.1505	0.1776
34	0.1474	0.1754
35	0.1448	0.1731
36	0.1427	0.1719
37	0.1405	0.1708
38	0.1382	0.1695
39	0.1356	0.1677
40	0.1334	0.1669
41	0.1309	0.1666
42	0.1286	0.1656
43	0.1274	0.1691
44	0.1261	0.1723
45	0.1248	0.1742
46	0.1233	0.1758
47	0.1217	0.1782
48	0.1200	0.1795
49	0.1183	0.1820
50	0.1166	0.1862
51	0.1154	0.1898
52	0.1144	0.2032
53	0.1137	0.2252
54	0.1130	0.2485
55	0.1130	0.2833
56	0.1130	0.3985
57	0.1131	0.0000
58	0.1128	0.0000
59	0.1133	0.0000
60	0.1133	0.0000

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TABLE 4: COMPLETE LISTING OF LIMA CURVES FOR 1970

N*	TURNOVER	NET PROFIT
2	1.0972	0.5773
3	0.6867	0.3682
4	0.5408	0.2930
5	0.4567	0.2524
6	0.4092	0.2620
7	0.3541	0.2507
8	0.3169	0.2366
9	0.2928	0.2160
10	0.2722	0.2040
11	0.2577	0.1991
12	0.2426	0.1750
13	0.2419	0.1640
14	0.2414	0.1565
15	0.2454	0.1535
16	0.2395	0.1477
17	0.2552	0.1463
18	0.2261	0.1461
19	0.2185	0.1470
20	0.2115	0.1456
21	0.2030	0.1441
22	0.1964	0.1420
23	0.1891	0.1427
24	0.1832	0.1423
25	0.1774	0.1427
26	0.1726	0.1416
27	0.1670	0.1414
28	0.1637	0.1402
29	0.1594	0.1383
30	0.1554	0.1378
31	0.1512	0.1371
32	0.1477	0.1377
33	0.1440	0.1391
34	0.1418	0.1394
35	0.1394	0.1410
36	0.1373	0.1425
37	0.1350	0.1433
38	0.1344	0.1437
39	0.1329	0.1452
40	0.1314	0.1464
41	0.1305	0.1492
42	0.1283	0.1511
43	0.1265	0.1550
44	0.1245	0.1580
45	0.1226	0.1642
46	0.1207	0.1705
47	0.1191	0.1771
48	0.1175	0.1834
49	0.1159	0.1960
50	0.1142	0.2165
51	0.1125	0.0000
52	0.1110	0.0000
53	0.1099	0.0000
54	0.1091	0.0000
55	0.1093	0.0000
56	0.1091	0.0000
57	0.1089	0.0000
58	0.1085	0.0000
59	0.1083	0.0000
60	0.1086	0.0000

EAU WOOL
TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1971

N*	TURNOVER	NET PROFIT
2	0.9035	0.7044
3	0.6302	0.5028
4	0.4545	0.4607
5	0.3969	0.3846
6	0.3901	0.3253
7	0.3580	0.2893
8	0.3330	0.2544
9	0.3056	0.2265
10	0.2938	0.2047
11	0.2758	0.1948
12	0.2631	0.1854
13	0.2593	0.1759
14	0.2584	0.1707
15	0.2513	0.1636
16	0.2416	0.1570
17	0.2559	0.1523
18	0.2226	0.1499
19	0.2141	0.1512
20	0.2062	0.1501
21	0.1993	0.1483
22	0.1928	0.1469
23	0.1874	0.1456
24	0.1825	0.1451
25	0.1773	0.1433
26	0.1719	0.1430
27	0.1680	0.1422
28	0.1655	0.1425
29	0.1589	0.1436
30	0.1564	0.1437
31	0.1500	0.1435
32	0.1452	0.1424
33	0.1424	0.1410
34	0.1397	0.1398
35	0.1387	0.1395
36	0.1371	0.1404
37	0.1354	0.1405
38	0.1337	0.1414
39	0.1318	0.1416
40	0.1300	0.1421
41	0.1283	0.1421
42	0.1268	0.1421
43	0.1255	0.1434
44	0.1241	0.1442
45	0.1223	0.1446
46	0.1215	0.1448
47	0.1201	0.1449
48	0.1183	0.1464
49	0.1174	0.1479
50	0.1167	0.1560
51	0.1159	0.1640
52	0.1155	0.1723
53	0.1152	0.1813
54	0.1143	0.1880
55	0.1142	0.1955
56	0.1134	0.0000
57	0.1130	0.0000
58	0.1127	0.0000
59	0.1130	0.0000
60	0.1131	0.0000
61	0.1132	0.0000

EAU WOOL

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1972

N*	TURNOVER	NET PROFITS
2	0.5321	0.7421
3	0.6640	0.4729
4	0.5249	0.5042
5	0.5081	0.4343
6	0.4652	0.3740
7	0.4187	0.3280
8	0.3926	0.2885
9	0.3621	0.2564
10	0.3336	0.2607
11	0.3078	0.2526
12	0.2958	0.2548
13	0.2822	0.2545
14	0.2692	0.2510
15	0.2548	0.2446
16	0.2461	0.2367
17	0.2373	0.2298
18	0.2265	0.2219
19	0.2207	0.2138
20	0.2130	0.2068
21	0.2050	0.2014
22	0.1963	0.1950
23	0.1911	0.1886
24	0.1860	0.1827
25	0.1800	0.1777
26	0.1755	0.1743
27	0.1700	0.1715
28	0.1659	0.1682
29	0.1625	0.1650
30	0.1589	0.1624
31	0.1555	0.1608
32	0.1520	0.1595
33	0.1483	0.1575
34	0.1462	0.1554
35	0.1438	0.1529
36	0.1428	0.1510
37	0.1414	0.1496
38	0.1396	0.1479
39	0.1377	0.1461
40	0.1357	0.1461
41	0.1337	0.1453
42	0.1317	0.1448
43	0.1297	0.1443
44	0.1282	0.1450
45	0.1269	0.1452
46	0.1256	0.1459
47	0.1246	0.1475
48	0.1236	0.1485
49	0.1226	0.1493
50	0.1223	0.1510
51	0.1221	0.1528
52	0.1221	0.1554
53	0.1220	0.1579
54	0.1216	0.1602
55	0.1213	0.1639
56	0.1216	0.1695
57	0.1216	0.1807
58	0.1219	0.2126
59	0.1221	0.2714
60	0.1242	0.0000

EAU WOOL

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1973

N*	TURNOVER	NET PROFITS
2	0.5897	0.5424
3	0.6309	0.3546
4	0.5542	0.3985
5	0.4868	0.3905
6	0.4410	0.3684
7	0.3847	0.3427
8	0.3745	0.3323
9	0.3467	0.3075
10	0.3183	0.3079
11	0.2908	0.2947
12	0.2684	0.2772
13	0.2632	0.2681
14	0.2538	0.2559
15	0.2419	0.2458
16	0.2341	0.2364
17	0.2249	0.2266
18	0.2156	0.2172
19	0.2063	0.2113
20	0.1994	0.2066
21	0.1931	0.2016
22	0.1863	0.1959
23	0.1796	0.1932
24	0.1732	0.1909
25	0.1679	0.1872
26	0.1643	0.1845
27	0.1608	0.1823
28	0.1569	0.1798
29	0.1534	0.1774
30	0.1506	0.1750
31	0.1474	0.1723
32	0.1449	0.1703
33	0.1426	0.1677
34	0.1400	0.1658
35	0.1380	0.1638
36	0.1370	0.1617
37	0.1365	0.1595
38	0.1353	0.1577
39	0.1340	0.1567
40	0.1327	0.1551
41	0.1313	0.1534
42	0.1297	0.1516
43	0.1281	0.1503
44	0.1263	0.1505
45	0.1246	0.1510
46	0.1253	0.1522
47	0.1255	0.1534
48	0.1252	0.1544
49	0.1251	0.1554
50	0.1247	0.1558
51	0.1243	0.1563
52	0.1239	0.1565
53	0.1235	0.1570
54	0.1233	0.1571
55	0.1233	0.1569
56	0.1236	0.1574
57	0.1236	0.1602
58	0.1236	0.1684
59	0.1248	0.1794
60	0.1267	0.0000

TABLES OF CONCENTRATION

ECONOMIC ACTIVITY UNITS

SUB-SECTOR: COTTON (NICE 233) U.K.

Prepared at the Cranfield Institute of Technology. Bedford.

TABLE 1: TOTAL VALUES OF THE SAMPLE 1968-73 (N^* = number of positive values)

	VARIABLE 01: TURNOVER			VARIABLE 04: NET PROFIT BEFORE TAX		
	N^*	£000	1968=100	N^*	£000	1968=100
1968	52	386,080	100	50	21,939	100
1969	50	414,989	107	48	20,002	91
1970	49	425,787	110	46	19,041	87
1971	48	457,806	119	44	19,588	89
1972	47	501,179	130	45	26,644	121
1973	47	590,237	153	45	37,576	171

TABLE 2: MEASURES OF CONCENTRATION

VARIABLE 01: TURNOVER

	N^*	MEAN	V	GINI	H-H	ENTROPY
1968						
1969	50	8,300	1.886	0.6789	91.1	-128.9
1970	49	8,689	1.799	0.6633	86.4	-130.8
1971	48	9,538	2.115	0.7070	114.0	-121.7
1972	47	10,663	1.999	0.6892	106.3	-124.0
1973	47	12,558	1.966	0.6836	103.5	-125.1

VARIABLE 04: NET PROFIT BEFORE TAX

1968						
1969	48	416.7	1.872	0.7112	93.9	-124.2
1970	46	413.9	1.939	0.7095	103.5	-122.3
1971	44	445.2	1.924	0.7535	106.9	-115.4
1972	45	592.1	1.911	0.7399	103.4	-117.7
1973	45	835.0	1.897	0.7226	102.2	-119.5

Note: The mean figures are in thousands of pounds; definitions of the four concentration measures are given on page

COTTON (EAU)

TABLE 3: LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

VARIABLE 01: TURNOVER

N*		1968	1969	1970	1971	1972	1973
4	L	0.399	0.428	0.450	0.740	0.639	0.587
	CR	56.2	55.0	52.6	57.9	56.6	56.0
8	L	0.464	0.434	0.411	0.495	0.461	0.433
	CR	68.4	68.0	66.3	71.3	70.6	70.8
10	L	0.411	0.377	0.356	0.407	0.393	0.396
	CR	72.8	73.0	71.4	76.6	75.8	75.5
12	L	0.359	0.329	0.306	0.365	0.362	0.361
	CR	76.6	77.3	76.1	80.7	79.7	79.3
20	L	0.283	0.272	0.254	0.320	0.308	0.304
	CR	86.5	87.8	87.4	90.1	89.5	88.9
30	L	0.236	0.244	0.223	0.294	0.280	0.270
	CR	93.2	94.0	94.1	95.3	94.8	94.6
40	L	0.218	0.224	0.210	0 264	0.246	0.234
	CR	97.0	97.7	98.0	98.5	98.4	98.4

SUMMARY COEFFICIENTS OF LINDA CURVES

1st Maximum	L	0.531	0.578	0.732	0.740	0.585	0.681
	CR	35.2	35.5	33.6	57.9	40.7	39.7
	N*H<	2	2	2	4	2	2
Overall Maximum	L						
	CR						
	N*H						
1st Minimum	L	0.399	0.428	0.450	0.537	0.570	0.303
	CR	56.2	55.0	52.6	43.0	51.3	85.5
	N*M	4	4	4	2	3	16
	LS	0.464	0.506	0.571	-	0.577	0.453

COTTON (EAU) (Cont'd)

TABLE 3: LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

VARIABLE 04: NET PROFITS

N*		1968	1969	1970	1971	1972	1973
4	L	0.334	0.356	0.541	0.403	0.371	0.375
	CR	67.2	56.8	55.3	58.5	58.1	58.0
8	L	0.582	0.382	0.378	0.361	0.373	0.426
	CR	77.8	72.2	73.1	77.3	77.6	76.2
10	L	0.515	0.353	0.369	0.305	0.348	0.401
	CR	81.6	77.4	77.8	84.2	82.9	80.6
12	L	0.468	0.321	0.340	0.293	0.343	0.373
	CR	84.7	81.5	81.8	88.9	86.6	84.2
20	L	0.389	0.298	0.300	0.388	0.376	0.337
	CR	92.4	91.0	91.5	95.7	94.1	92.6
30	L	0.363	0.281	0.281	0.456	0.383	0.330
	CR	96.7	96.2	96.8	98.7	97.6	97.0
40	L	0.361	0.269	0.302	0.570	0.384	0.330
	CR	98.9	99.3	99.4	99.9	99.6	99.5

SUMMARY COEFFICIENTS OF LINDA CURVES

1st Maximum	L	0.530	0.500	0.655	0.827	0.607	0.532
	CR	39.0	33.0	48.0	35.2	34.9	34.6
	N*H<	2	2	3	2	2	2
Overall Maximum	L	0.6096			0.9645	0.6604	0.5513
	CR	75.7			100.0	100.0	100.0
	N*H	7			44	45	45
1st Minimum	L	0.335	0.356	0.503	0.390	0.320	0.318
	CR	67.2	56.8	40.0	65.3	67.1	67.1
	N*M	4	4	2	5	5	5
	LS	0.426	0.409	-	0.533	0.440	0.407

EAU COTTON

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1968

N*	TURNOVER	NET PROFITS
2	0.5311	0.5301
3	0.4621	0.4128
4	0.3935	0.3347
5	0.5086	0.4092
6	0.5075	0.5991
7	0.4767	0.6096
8	0.4638	0.5318
9	0.4317	0.5450
10	0.4105	0.5147
11	0.3851	0.4966
12	0.3583	0.4683
13	0.3412	0.4551
14	0.3270	0.4415
15	0.3123	0.4243
16	0.3055	0.4068
17	0.3011	0.4022
18	0.2943	0.3956
19	0.2900	0.3923
20	0.2825	0.3887
21	0.2761	0.3856
22	0.2693	0.3871
23	0.2655	0.3862
24	0.2611	0.3839
25	0.2561	0.3794
26	0.2509	0.3741
27	0.2457	0.3671
28	0.2418	0.3652
29	0.2377	0.3626
30	0.2361	0.3632
31	0.2356	0.3626
32	0.2337	0.3615
33	0.2335	0.3597
34	0.2321	0.3568
35	0.2302	0.3592
36	0.2285	0.3595
37	0.2267	0.3587
38	0.2243	0.3595
39	0.2215	0.3607
40	0.2183	0.3609
41	0.2150	0.3605
42	0.2115	0.3633
43	0.2084	0.3640
44	0.2053	0.3643
45	0.2035	0.3643
46	0.2032	0.3675
47	0.2023	0.3752
48	0.2025	0.3815
49	0.2020	0.3855
50	0.2049	0.5469
51	0.2092	0.0000
52	0.2142	0.0000

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TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1969

N*	TURNOVER	NET PROFIT%
2	0.5775	0.5000
3	0.5154	0.3707
4	0.4279	0.3562
5	0.5243	0.4112
6	0.5056	0.4329
7	0.4671	0.4065
8	0.4341	0.3816
9	0.3996	0.3529
10	0.3774	0.3529
11	0.3514	0.3394
12	0.3235	0.3206
13	0.3067	0.3094
14	0.2870	0.3001
15	0.2804	0.2973
16	0.2850	0.2897
17	0.2851	0.2889
18	0.2842	0.2925
19	0.2774	0.2962
20	0.2716	0.2977
21	0.2710	0.2954
22	0.2675	0.2940
23	0.2623	0.2960
24	0.2585	0.2962
25	0.2550	0.2973
26	0.2537	0.2964
27	0.2502	0.2937
28	0.2472	0.2899
29	0.2453	0.2853
30	0.2450	0.2807
31	0.2418	0.2756
32	0.2391	0.2725
33	0.2376	0.2703
34	0.2358	0.2688
35	0.2346	0.2678
36	0.2334	0.2681
37	0.2313	0.2676
38	0.2292	0.2682
39	0.2267	0.2694
40	0.2243	0.2699
41	0.2217	0.2747
42	0.2192	0.2793
43	0.2171	0.2871
44	0.2162	0.3094
45	0.2147	0.3288
46	0.2163	0.3430
47	0.2170	0.3592
48	0.2203	0.5795
49	0.2241	0.0000
50	0.2274	0.0000

EAU COTTON
TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1970

N*	TURNOVER	NET PROFITS
2	0.7315	0.5026
3	0.5314	0.6552
4	0.4501	0.5405
5	0.5098	0.5033
6	0.4874	0.4463
7	0.4490	0.4089
8	0.4112	0.3780
9	0.3864	0.3764
10	0.3537	0.3688
11	0.3293	0.3560
12	0.3050	0.3399
13	0.2846	0.3270
14	0.2740	0.3160
15	0.2662	0.3026
16	0.2567	0.2993
17	0.2567	0.2974
18	0.2542	0.2993
19	0.2561	0.2985
20	0.2538	0.3000
21	0.2501	0.2977
22	0.2462	0.2962
23	0.2434	0.2933
24	0.2392	0.2908
25	0.2356	0.2918
26	0.2321	0.2919
27	0.2312	0.2897
28	0.2286	0.2859
29	0.2256	0.2821
30	0.2234	0.2807
31	0.2233	0.2821
32	0.2255	0.2815
33	0.2222	0.2816
34	0.2208	0.2810
35	0.2196	0.2809
36	0.2170	0.2798
37	0.2148	0.2803
38	0.2136	0.2881
39	0.2116	0.2960
40	0.2101	0.3019
41	0.2089	0.3055
42	0.2073	0.3144
43	0.2073	0.3230
44	0.2065	0.3338
45	0.2078	0.3454
46	0.2106	0.5413
47	0.2135	0.0000
48	0.2167	0.0000
49	0.2195	0.0000

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TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1971

N*	TURNOVER	NET PROFITS
2	0.5368	0.8269
3	0.5794	0.5110
4	0.7403	0.4029
5	0.7201	0.3901
6	0.6263	0.4080
7	0.5386	0.3916
8	0.4940	0.3608
9	0.4468	0.3325
10	0.4072	0.3051
11	0.3854	0.3045
12	0.3653	0.2928
13	0.3552	0.2094
14	0.3401	0.3254
15	0.3220	0.3361
16	0.3130	0.3430
17	0.3127	0.3587
18	0.3191	0.3732
19	0.3207	0.3821
20	0.3196	0.3883
21	0.3190	0.3973
22	0.3158	0.4050
23	0.3106	0.4121
24	0.3057	0.4176
25	0.3050	0.4235
26	0.3033	0.4283
27	0.2995	0.4415
28	0.2943	0.4486
29	0.2945	0.4508
30	0.2936	0.4555
31	0.2910	0.4691
32	0.2877	0.4759
33	0.2835	0.4805
34	0.2787	0.4836
35	0.2754	0.4877
36	0.2754	0.4925
37	0.2710	0.5059
38	0.2687	0.5336
39	0.2657	0.5524
40	0.2640	0.5704
41	0.2635	0.6162
42	0.2628	0.6495
43	0.2618	0.6864
44	0.2650	0.9645
45	0.2614	0.0000
46	0.2643	0.0000
47	0.2698	0.0000
48	0.2802	0.0000

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TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1972

N*	TURNOVER	NET PROFITS
2	0.5845	0.6071
3	0.5702	0.4615
4	0.6393	0.3707
5	0.6190	0.3201
6	0.5792	0.3954
7	0.5119	0.5495
8	0.4606	0.3751
9	0.4233	0.3620
10	0.3930	0.3478
11	0.3816	0.3424
12	0.3622	0.3425
13	0.3464	0.3522
14	0.3283	0.3509
15	0.3095	0.3482
16	0.3029	0.3392
17	0.2979	0.3400
18	0.3073	0.3441
19	0.3094	0.3612
20	0.3076	0.3764
21	0.3067	0.3890
22	0.3033	0.3938
23	0.3003	0.3983
24	0.2965	0.3996
25	0.2943	0.4010
26	0.2933	0.4003
27	0.2902	0.3978
28	0.2859	0.3936
29	0.2828	0.3882
30	0.2803	0.3827
31	0.2773	0.3759
32	0.2740	0.3711
33	0.2690	0.3763
34	0.2659	0.3810
35	0.2610	0.3831
36	0.2538	0.3851
37	0.2563	0.3848
38	0.2535	0.3846
39	0.2501	0.3851
40	0.2464	0.3833
41	0.2442	0.3905
42	0.2421	0.3983
43	0.2400	0.4130
44	0.2400	0.4526
45	0.2394	0.6004
46	0.2417	0.0000
47	0.2450	0.0000

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TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1973

N*	TURNOVER	NET PROFITS
2	0.6411	0.5317
3	0.6225	0.4025
4	0.5871	0.3747
5	0.5602	0.3180
6	0.5367	0.3795
7	0.4835	0.4316
8	0.4328	0.4257
9	0.4210	0.4114
10	0.3962	0.4009
11	0.3794	0.3875
12	0.3614	0.3727
13	0.3503	0.3716
14	0.3352	0.3618
15	0.3174	0.3491
16	0.3029	0.3363
17	0.3047	0.3237
18	0.3043	0.3336
19	0.3069	0.3371
20	0.3036	0.3372
21	0.3001	0.3350
22	0.2972	0.3320
23	0.2917	0.3358
24	0.2850	0.3415
25	0.2855	0.3419
26	0.2837	0.3390
27	0.2801	0.3309
28	0.2760	0.3373
29	0.2741	0.3335
30	0.2703	0.3295
31	0.2660	0.3285
32	0.2627	0.3278
33	0.2583	0.3267
34	0.2550	0.3251
35	0.2507	0.3237
36	0.2466	0.3235
37	0.2429	0.3249
38	0.2387	0.3269
39	0.2358	0.3277
40	0.2336	0.3301
41	0.2321	0.3366
42	0.2320	0.3401
43	0.2343	0.3418
44	0.2354	0.3502
45	0.2372	0.5593
46	0.2389	0.0000
47	0.2374	0.0000

TABLES OF CONCENTRATION

ECONOMIC ACTIVITY UNITS

SUB-SECTOR: HOSIERY & OTHER KNITTED GOODS (NICE 237) U.K.

Prepared at the Cranfield Institute of Technology, Bedford.

TABLE 1: TOTAL VALUES OF THE SAMPLE 1968-73 (N* = number of positive values)

	VARIABLE 01: TURNOVER			VARIABLE 04: NET PROFIT BEFORE TAX		
	N*	£000	1968=100	N*	£000	1968=100
1968	60	364,691	100	57	25,904	100
1969	60	392,215	108	56	23,539	91
1970	60	431,175	118	51	25,399	98
1971	60	461,597	127	52	29,692	115
1972	60	483,018	132	56	33,314	129
1973	60	583,750	160	57	42,193	163

TABLE 2: MEASURES OF CONCENTRATION

	N*	MEAN	V	GINI	H-H	ENTROPY
VARIABLE 01: TURNOVER						
1968	60	6,078	2.535	0.6937	123.8	-128.4
1969	60	6,537	2.530	0.6903	123,3	-128.9
1970	60	7,186	2.583	0.6899	127,9	-128.5
1971	60	7,693	2.608	0.6983	130.1	-127.1
1972	60	8,050	2.496	0.6869	120.5	-129.5
1973	60	9,729	2.389	0.6841	111.8	-131.0
VARIABLE 04: NET PROFIT BEFORE TAX						
1968	57	454.5	2.065	0.7127	92.3	-129.6
1969	56	420.3	2.318	0.7329	113.8	-123.6
1970	51	498.0	2.473	0.7305	139.6	-117.1
1971	52	571.0	2.248	0.7080	116.4	-122.9
1972	56	594.9	2.185	0.6940	103.1	-128.4
1973	57	740.2	2.263	0.7133	107.4	-126.8

Note: The mean figures are in thousands of pounds; definitions of the four concentration measures are given on page

TABLE 3: LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

VARIABLE 01: TURNOVER

N*		1968	1969	1970	1971	1972	1973
4	L	0.833	0.831	0.877	0.829	0.763	0.709
	CR	52.9	52.3	53.5	54.6	53.8	52.1
8	L	0.478	0.444	0.498	0.521	0.488	0.449
	CR	69.7	69.5	68.3	69.9	68.7	68.4
10	L	0.504	0.474	0.462	0.506	0.483	0.468
	CR	72.6	72.7	72.4	73.3	72.1	71.7
12	L	0.462	0.445	0.439	0.476	0.448	0.440
	CR	75.4	75.5	75.3	76.0	75.0	74.4
20	L	0.327	0.326	0.330	0.346	0.329	0.324
	CR	84.0	83.6	83.4	84.0	83.4	82.9
30	L	0.253	0.249	0.252	0.267	0.253	0.238
	CR	90.5	90.4	90.2	90.3	89.9	90.1
40	L	0.215	0.216	0.210	0.220	0.209	0.202
	CR	94.9	94.8	94.8	94.9	94.6	94.8

SUMMARY COEFFICIENTS OF LINDA CURVES

1st Maximum	L	1.900	1.922	1.878	1.871	1.721	1.752
	CR	39.5	39.5	40.8	41.2	39.5	37.2
	N*H<	2	2	2	2	2	2
Overall Maximum	L						
	CR						
	N*H						
1st Minimum	L	0.478	0.444	0.180	0.184	0.175	0.449
	CR	67.3	69.5	99.8	99.8	100	68.4
	N*M	7	8	59	58	60	8
	LS	0.912	0.872	0.339	0.350	0.326	0.776

TABLE 3: LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

VARIABLE 04: NET PROFITS

N*		1968	1969	1970	1971	1972	1973
4	L	0.550	0.612	0.856	0.622	0.650	0.632
	CR	52.8	58.1	62.7	60.2	56.1	56.9
8	L	0.374	0.523	0.734	0.616	0.585	0.508
	CR	69.7	71.4	73.4	71.4	67.7	70.0
10	L	0.341	0.461	0.766	0.556	0.505	0.496
	CR	75.1	75.6	76.6	74.8	71.4	73.4
12	L	0.332	0.422	0.792	0.486	0.431	0.442
	CR	78.9	79.0	79.3	77.8	74.8	76.5
20	L	0.308	0.317	0.884	0.329	0.294	0.303
	CR	87.3	88.2	88.4	87.0	84.5	86.1
30	L	0.256	0.266	0.953	0.251	0.220	0.239
	CR	93.1	94.4	95.3	93.9	92.6	93.3
40	L	0.230	0.251	0.989	0.224	0.201	0.223
	CR	97.0	97.9	98.9	98.2	97.2	97.2

SUMMARY COEFFICIENTS OF LINDA CURVES

1st Maximum	L	0.609	0.728	0.856	0.655	0.650	0.632
	CR	36.6	51.3	62.7	64.0	56.1	56.9
	N*H<	2	3	4	5	4	4
Overall Maximum	L						
	CR						
	N*H						
1st Minimum	L	0.332	0.512	0.623	0.551	0.506	0.506
	CR	78.9	43.6	49.7	43.7	40.5	42.0
	N*M	12	2	2	2	2	2
	LS	0.438	-	-	-	-	-

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TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1968

N*	TURNOVER	NET PROFITS
2	1.9000	0.6086
3	1.0437	0.5558
4	0.8332	0.5502
5	0.6682	0.5055
6	0.5284	0.4619
7	0.4780	0.4122
8	0.4780	0.3734
9	0.5093	0.3507
10	0.5035	0.3414
11	0.4565	0.3274
12	0.4614	0.3318
13	0.4414	0.3330
14	0.4220	0.3294
15	0.4042	0.3244
16	0.3842	0.3147
17	0.3654	0.3083
18	0.3471	0.3042
19	0.3330	0.3032
20	0.3266	0.3077
21	0.3211	0.3060
22	0.3140	0.3041
23	0.3071	0.2994
24	0.2950	0.2936
25	0.2912	0.2866
26	0.2856	0.2792
27	0.2761	0.2733
28	0.2683	0.2672
29	0.2605	0.2611
30	0.2529	0.2555
31	0.2466	0.2503
32	0.2418	0.2454
33	0.2376	0.2423
34	0.2350	0.2388
35	0.2328	0.2350
36	0.2287	0.2309
37	0.2252	0.2292
38	0.2220	0.2284
39	0.2187	0.2301
40	0.2154	0.2304
41	0.2122	0.2300
42	0.2083	0.2302
43	0.2055	0.2300
44	0.2030	0.2293
45	0.2018	0.2280
46	0.2014	0.2265
47	0.2003	0.2253
48	0.1997	0.2247
49	0.1982	0.2232
50	0.1967	0.2219
51	0.1955	0.2224
52	0.1941	0.2234
53	0.1920	0.2278
54	0.1903	0.2342
55	0.1890	0.2426
56	0.1876	0.2664
57	0.1862	0.2654
58	0.1847	0.0000
59	0.1834	0.0000
60	0.1820	0.0000

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TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1969

N*	TURNOVER	NET PROFITS
2	1.9219	0.5124
3	1.2255	0.7278
4	0.8506	0.6120
5	0.6588	0.5596
6	0.5416	0.5053
7	0.4643	0.5670
8	0.4457	0.5226
9	0.4062	0.4880
10	0.4741	0.4607
11	0.4597	0.4328
12	0.4445	0.4222
13	0.4340	0.4045
14	0.4266	0.3833
15	0.4107	0.3638
16	0.3923	0.3443
17	0.3753	0.3421
18	0.3583	0.3340
19	0.3417	0.3251
20	0.3259	0.3174
21	0.3123	0.3126
22	0.3027	0.3054
23	0.2948	0.2992
24	0.2889	0.2914
25	0.2818	0.2883
26	0.2740	0.2832
27	0.2675	0.2792
28	0.2603	0.2751
29	0.2540	0.2703
30	0.2487	0.2661
31	0.2431	0.2621
32	0.2395	0.2589
33	0.2351	0.2549
34	0.2307	0.2512
35	0.2269	0.2499
36	0.2254	0.2487
37	0.2224	0.2471
38	0.2203	0.2491
39	0.2180	0.2506
40	0.2155	0.2510
41	0.2126	0.2519
42	0.2094	0.2523
43	0.2070	0.2518
44	0.2057	0.2509
45	0.2035	0.2515
46	0.2012	0.2543
47	0.1991	0.2620
48	0.1968	0.2684
49	0.1945	0.2728
50	0.1924	0.2768
51	0.1913	0.2805
52	0.1899	0.2850
53	0.1881	0.2956
54	0.1862	0.3069
55	0.1842	0.3223
56	0.1829	0.3551
57	0.1822	0.0000
58	0.1811	0.0000
59	0.1799	0.0000
60	0.1791	0.0000

TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1970

N*	TURNOVER	NET PROFITS
2	1.8784	0.6225
3	1.1936	0.8030
4	0.8771	0.8554
5	0.7478	0.8185
6	0.6192	0.7890
7	0.5483	0.7122
8	0.4977	0.6946
9	0.4654	0.6579
10	0.4620	0.6275
11	0.4567	0.5930
12	0.4391	0.5576
13	0.4305	0.5197
14	0.4204	0.4906
15	0.4048	0.4614
16	0.3930	0.4327
17	0.3775	0.4083
18	0.3615	0.3872
19	0.3452	0.3681
20	0.3304	0.3517
21	0.3167	0.3352
22	0.3092	0.3226
23	0.2998	0.3127
24	0.2915	0.3056
25	0.2835	0.3005
26	0.2770	0.2959
27	0.2696	0.2849
28	0.2641	0.2844
29	0.2582	0.2782
30	0.2521	0.2716
31	0.2458	0.2675
32	0.2398	0.2638
33	0.2336	0.2592
34	0.2301	0.2542
35	0.2268	0.2513
36	0.2220	0.2535
37	0.2190	0.2561
38	0.2156	0.2570
39	0.2125	0.2591
40	0.2103	0.2599
41	0.2075	0.2614
42	0.2045	0.2651
43	0.2020	0.2736
44	0.2000	0.2814
45	0.1993	0.2864
46	0.1979	0.2922
47	0.1962	0.3047
48	0.1945	0.3414.
49	0.1928	0.3766
50	0.1915	0.4224
51	0.1893	0.5159
52	0.1886	0.0000
53	0.1872	0.0000
54	0.1859	0.0000
55	0.1842	0.0000
56	0.1824	0.0000
57	0.1810	0.0000
58	0.1807	0.0000
59	0.1801	0.0000
60	0.1811	0.0000

EAU HOSIERY
TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1971

N*	TURNOVER	NET PROFITS
2	1.6171	0.5511
3	1.1453	0.5932
4	0.8290	0.6221
5	0.6466	0.6549
6	0.5806	0.6158
7	0.5355	0.6259
8	0.5214	0.6160
9	0.5130	0.5769
10	0.5055	0.5563
11	0.4843	0.5218
12	0.4757	0.4861
13	0.4606	0.4584
14	0.4403	0.4306
15	0.4192	0.4078
16	0.4080	0.3857
17	0.3921	0.3673
18	0.3754	0.3488
19	0.3593	0.3393
20	0.3467	0.3288
21	0.3403	0.3178
22	0.3325	0.3137
23	0.3239	0.3070
24	0.3153	0.2900
25	0.3061	0.2904
26	0.2967	0.2815
27	0.2872	0.2733
28	0.2806	0.2651
29	0.2742	0.2583
30	0.2674	0.2513
31	0.2603	0.2456
32	0.2532	0.2401
33	0.2461	0.2374
34	0.2418	0.2335
35	0.2366	0.2314
36	0.2332	0.2302
37	0.2297	0.2291
38	0.2258	0.2275
39	0.2224	0.2258
40	0.2196	0.2240
41	0.2164	0.2237
42	0.2134	0.2223
43	0.2101	0.2253
44	0.2085	0.2276
45	0.2066	0.2346
46	0.2043	0.2401
47	0.2019	0.2454
48	0.1993	0.2515
49	0.1973	0.2627
50	0.1951	0.2719
51	0.1933	0.2813
52	0.1918	0.3310
53	0.1901	0.0000
54	0.1888	0.0000
55	0.1873	0.0000
56	0.1865	0.0000
57	0.1854	0.0000
58	0.1843	0.0000
59	0.1849	0.0000
60	0.1966	0.0000

EAU HOSIERY
TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1972

N*	TURNOVER	NET PROFITS
2	1.7209	0.5057
3	1.0388	0.5312
4	0.7630	0.6500
5	0.6686	0.5713
6	0.5795	0.6187
7	0.5110	0.6040
8	0.4684	0.5845
9	0.4866	0.5479
10	0.4832	0.5046
11	0.4627	0.4663
12	0.4478	0.4314
13	0.4296	0.4024
14	0.4137	0.3852
15	0.3944	0.3659
16	0.3824	0.3534
17	0.3630	0.3390
18	0.3541	0.3235
19	0.3421	0.3086
20	0.3289	0.2938
21	0.3230	0.2814
22	0.3148	0.2694
23	0.3053	0.2580
24	0.2958	0.2523
25	0.2887	0.2485
26	0.2809	0.2431
27	0.2730	0.2376
28	0.2665	0.2320
29	0.2595	0.2261
30	0.2529	0.2204
31	0.2464	0.2151
32	0.2390	0.2099
33	0.2338	0.2072
34	0.2306	0.2042
35	0.2269	0.2020
36	0.2227	0.2019
37	0.2192	0.2009
38	0.2157	0.2018
39	0.2126	0.2019
40	0.2092	0.2013
41	0.2074	0.2006
42	0.2054	0.2005
43	0.2038	0.2004
44	0.2019	0.2001
45	0.1997	0.1992
46	0.1973	0.1991
47	0.1950	0.2002
48	0.1926	0.2024
49	0.1901	0.2036
50	0.1878	0.2078
51	0.1853	0.2121
52	0.1833	0.2151
53	0.1826	0.2212
54	0.1816	0.2336
55	0.1803	0.3000
56	0.1790	0.4265
57	0.1777	0.0000
58	0.1765	0.0000
59	0.1758	0.0000
60	0.1751	0.0000

FAU HOSIERY

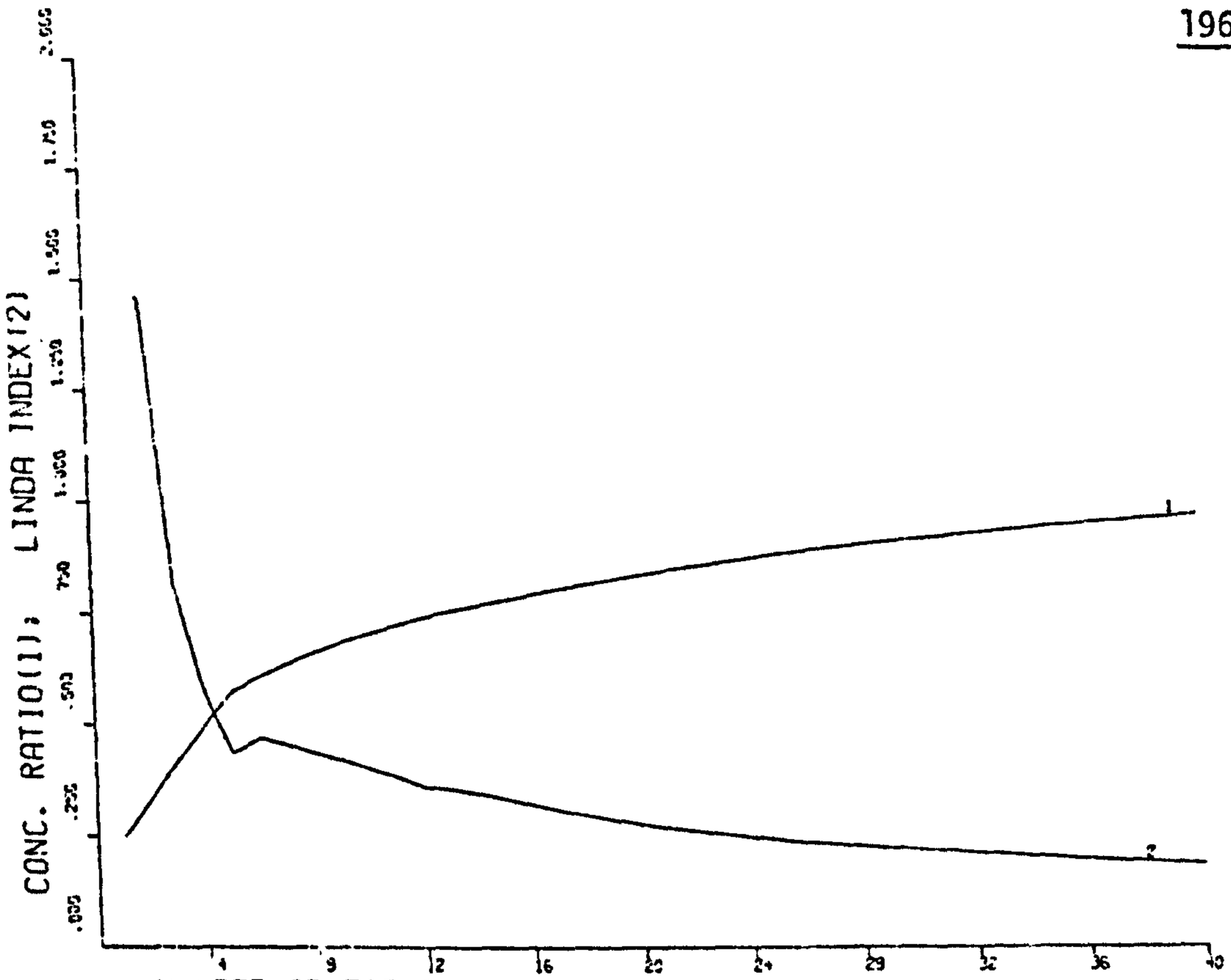
TABLE 4: COMPLETE LISTING OF LINDA CURVES FOR 1973

N*	TURNOVER	NET PROFITS
2	1.7510	0.5059
3	0.9625	0.6119
4	0.7094	0.6316
5	0.5602	0.5763
6	0.5280	0.5982
7	0.4694	0.5529
8	0.4487	0.5078
9	0.4630	0.5127
10	0.4483	0.4959
11	0.4584	0.4699
12	0.4403	0.4424
13	0.4178	0.4141
14	0.3924	0.3874
15	0.3753	0.3749
16	0.3593	0.3601
17	0.3536	0.3437
18	0.3435	0.3294
19	0.3347	0.3155
20	0.3244	0.3028
21	0.3132	0.2917
22	0.3020	0.2823
23	0.2912	0.2780
24	0.2805	0.2721
25	0.2716	0.2651
26	0.2617	0.2579
27	0.2553	0.2504
28	0.2483	0.2436
29	0.2435	0.2415
30	0.2382	0.2389
31	0.2326	0.2355
32	0.2277	0.2332
33	0.2229	0.2299
34	0.2180	0.2266
35	0.2135	0.2265
36	0.2110	0.2242
37	0.2096	0.2252
38	0.2072	0.2252
39	0.2046	0.2243
40	0.2024	0.2234
41	0.1994	0.2223
42	0.1974	0.2232
43	0.1962	0.2231
44	0.1946	0.2255
45	0.1926	0.2273
46	0.1913	0.2282
47	0.1896	0.2288
48	0.1883	0.2284
49	0.1864	0.2290
50	0.1846	0.2294
51	0.1829	0.2320
52	0.1817	0.2371
53	0.1807	0.2403
54	0.1800	0.2436
55	0.1792	0.2462
56	0.1782	0.2551
57	0.1787	0.2683
58	0.1786	0.0000
59	0.1781	0.0000
60	0.1776	0.0000

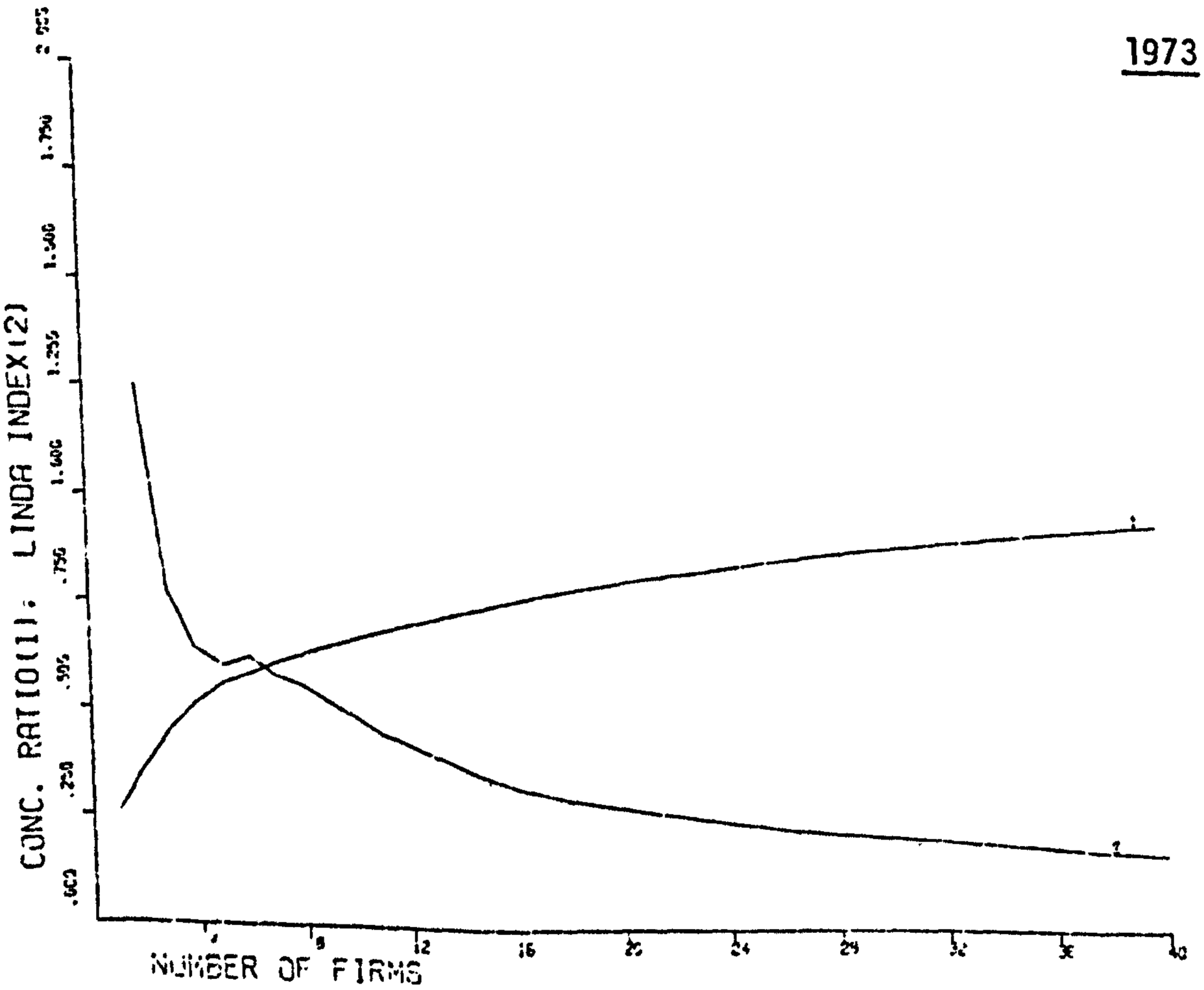
CONCENTRATION RATIOS & LINDA INDICES FOR TURNOVER IN 1968 & 1973

ECONOMIC ACTIVITY UNITS: TEXTILES

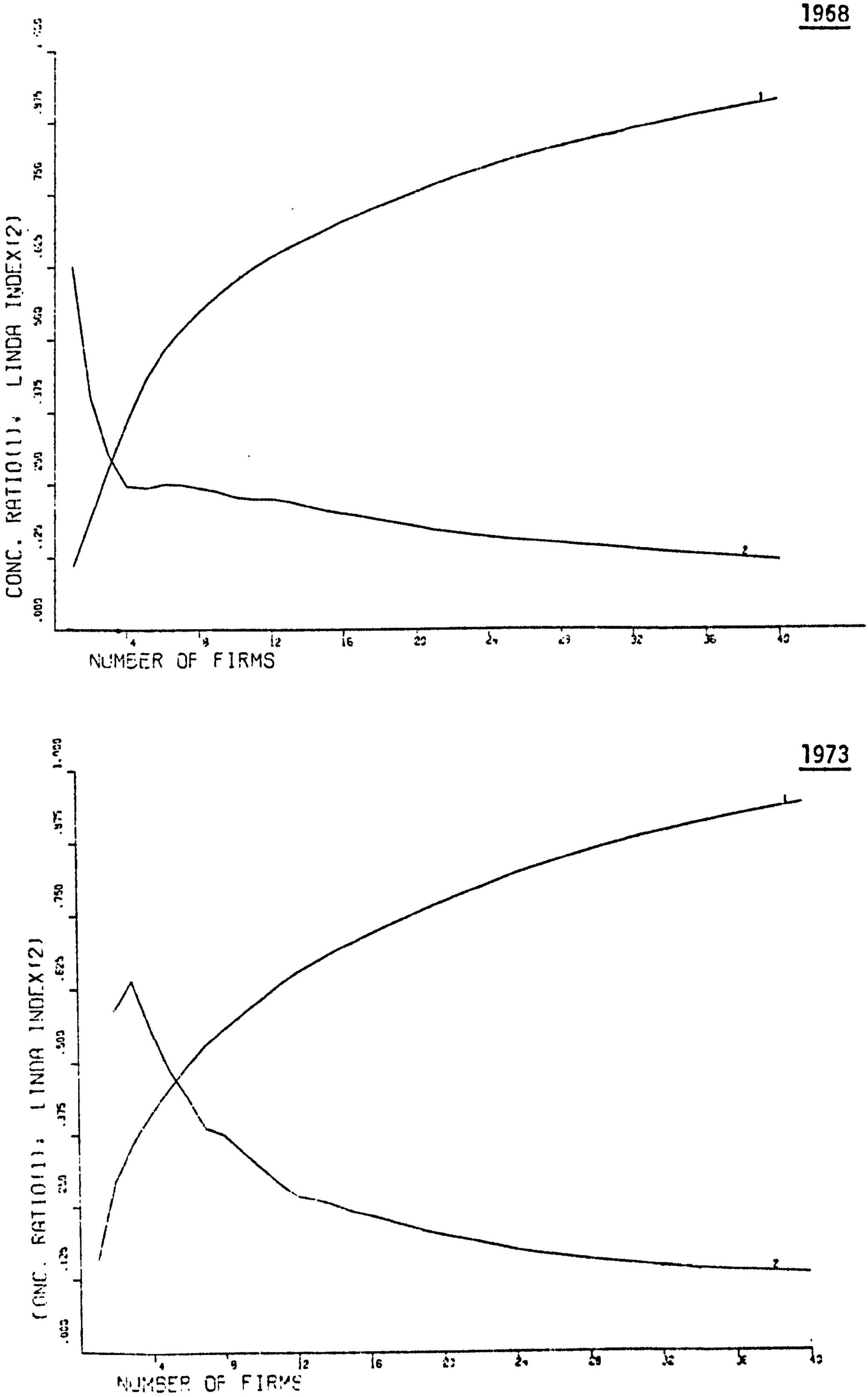
1968



1973

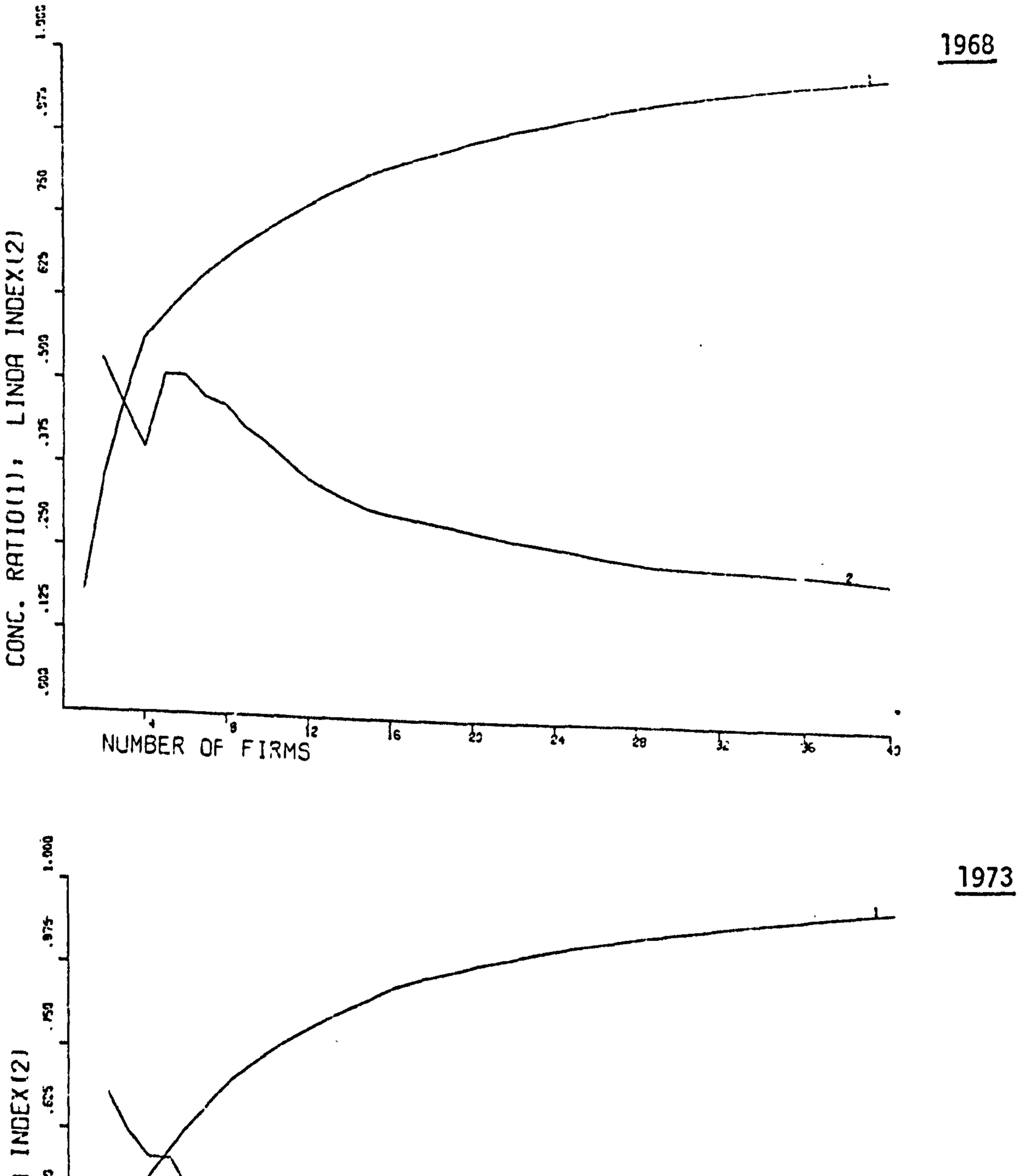


ECONOMIC ACTIVITY UNITS: WOOL



CONCENTRATION RATIOS & LINDA INDICES FOR TURNOVER IN 1968 & 1973

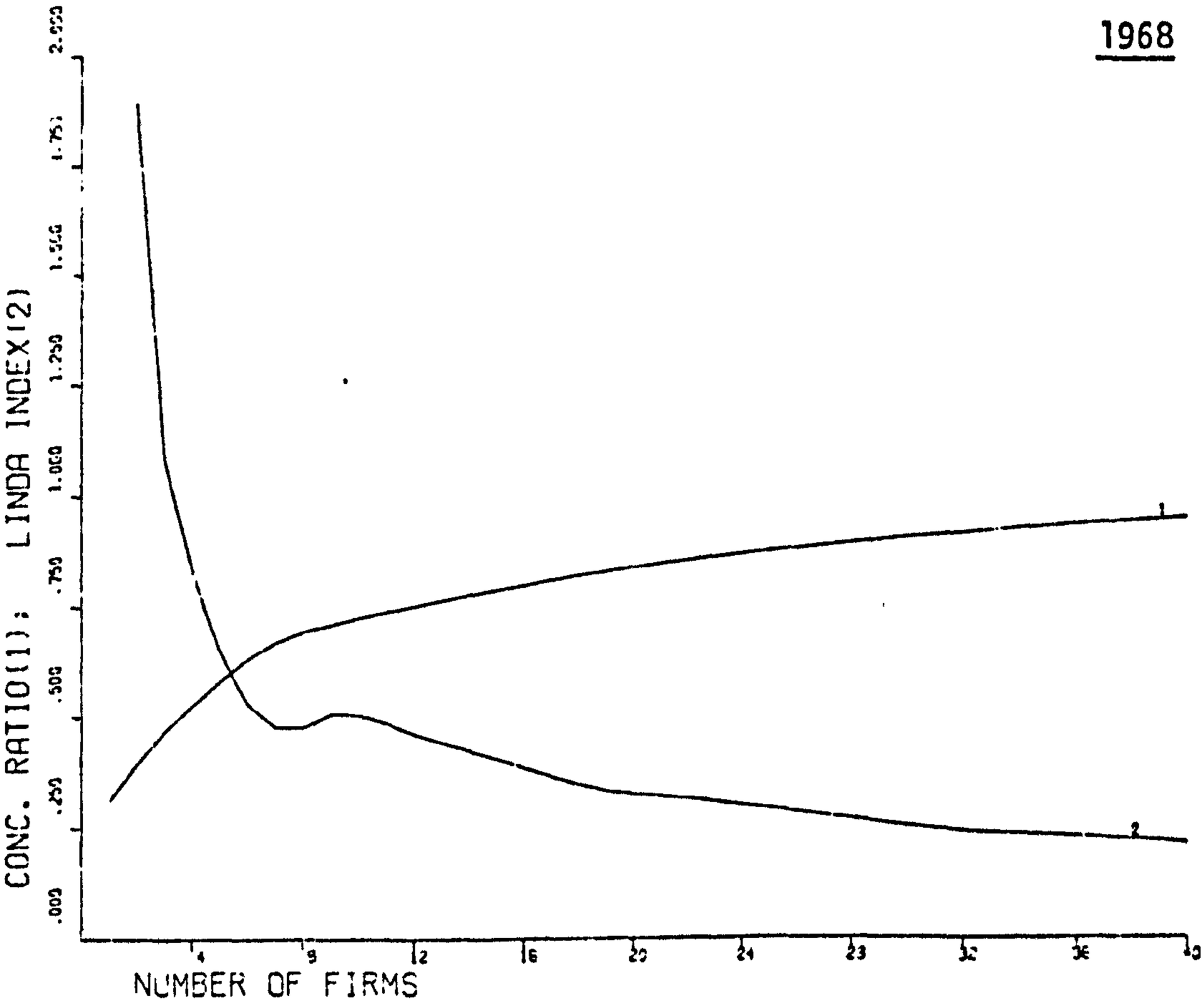
ECONOMIC ACTIVITY UNITS: COTTON



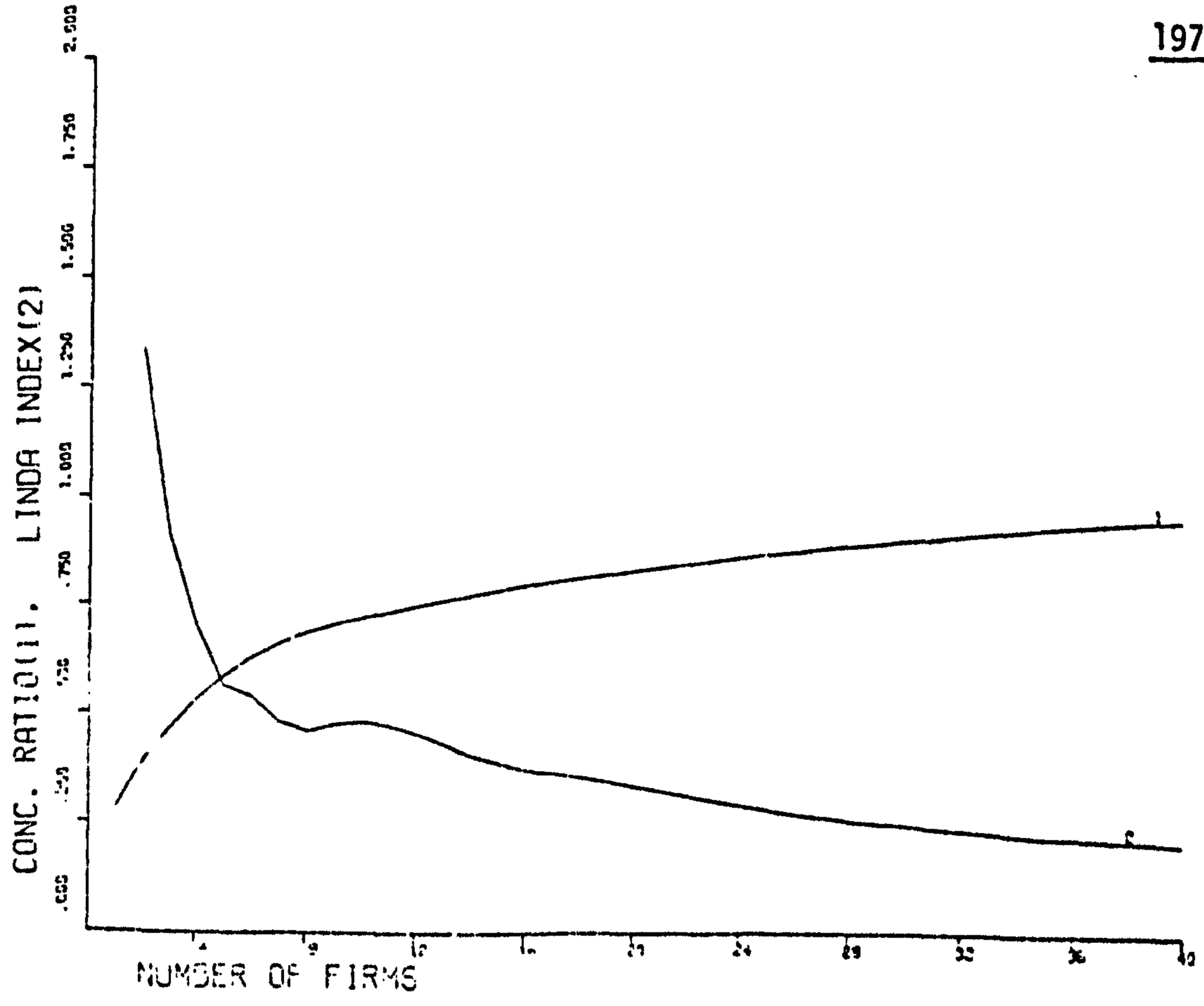
CONCENTRATION RATIOS & LINDA INDICES FOR TURNOVER IN 1968 & 1973

ECONOMIC ACTIVITY UNITS: HOSIERY

1968



1973



APPENDIX C

ESTIMATES OF TOTAL SUB-SECTOR SALES

1. Wool and worsted

1969 — No data available

1968, 1970, 1971 — Census of Production figures available. Figure used was "sales of goods produced and work done" by establishments classified to the sub-sector.

1972, 1973 — Data produced in Business Monitor PQ 414, third quarter 1974 referring to establishments with 25 or more employees. In 1971 (Census) such establishments accounted for 95 per cent of total employment. The figures for 1972 and 1973 were therefore multiplied by $\frac{100}{95}$ to give estimates of total turnover of establishments classified to the sub-sector.

Resulting estimates (£m)

	Overall turnover of sub-sector	Sample total	Sample as % of overall
1968	559	315.3	56
1969	-	341.0	(58)
1970	565	333.8	59
1971	530	346.2	65
1972	626	398.2	64
1973	835	499.7	60

2. Cotton

The main difficulty relates to vertically integrated firms (explained in the main text p.). About 70 per cent of all cotton and man-made fibre spun yarn is used for weaving, and in 1968 about 45 per cent

of all weaving capacity was held by vertically integrated concerns and the effects of vertical integration varies considerably between firms, while some use over 70 per cent of their own yarns and buy little yarn from outside, in others less than 50 per cent of yarn production is used within the firm and more than 50 per cent of yarn consumption is purchased outside. On the other hand, the large vertically integrated concerns have a greater proportion of modern looms which they use more intensively, so that the 45 per cent of weaving capacity understates their share of cloth output. In addition, as much as half of the 12-14 per cent of sales of cotton and spun man-made fibre yarns going to knitting are probably inter-group transactions (since weft-knitting of such yarns, as opposed to filament or worsted type, is carried out, mainly by firms with Lancashire spinning interests). As a broad estimate it is assumed that 40 per cent of all yarns spun on the cotton system are used for weaving or knitting by the same company. This proportion was deducted from the 1968 Census figure of turnover in cotton and man-made fibre spinning and the residue was added to weaving sales to give a combined figure for sales to outside firms by companies in the sub-sector. This figure came to £433 millions and the sample total of 52 firms with turnover exceeding £1 million in this sub-sector represented 73 per cent of this overall total for about 590 firms.

There is very little information about vertical integration since 1968. If it were assumed that inter-group sales of yarn remained at 40 per cent then the percentage of cotton industry turnover represented by the sample in 1973 would be 80 per cent. With a greater degree of vertical organisation now existing in some major groups, the ratio may be somewhat higher. The following percentages are assumed:

	%
1968	73
1969	74
1970	75
1971	77
1972	80
1973	82

3. Hosiery and Knitwear

Data are available exactly as for wool and worsted. The ratio for adjustment of figures for 1972 and 1973, to include firms employing fewer than 25 workers was 1.04:-

	Resulting estimates(£m)		
	Overall turnover of sub-sector	Sample total	Sample as % of overal
1968	437.3	364.7	83
1969	-	392.2	(82)
1970	537.6	431.2	80
1971	533.4	461.6	87
1972	580.7	483.0	83
1973	662.3	598.8	90

APPENDIX D

RANKING OF FINANCIAL VARIABLES

The use of parameters of the Linda curves to compare concentration in different variables is valid only if the ranking of companies is similar for each of these variables. This has been tested by use of rank correlation coefficients.

1. RANK CORRELATION MATRIX: ENTERPRISES 1968

Variable	Turnover	Employment	Wage-bill	Net profits	Cash flow	Gross Investment	Equity	Exports	Net assets
Turnover									
Employment	0.76								
Wage-bill	0.80	0.94							
Net profits	0.66	0.62	0.63						
Cash flow	0.73	0.65	0.70	0.94					
Gross Investment	0.59	0.59	0.67	0.67	0.74				
Equity	0.80	0.81	0.78	0.61	0.64	0.58			
Exports	0.56	0.37	0.41	0.34	0.40	0.37	0.45		
Net assets	0.80	0.80	0.80	0.63	0.70	0.65	0.91	0.56	
Net cash flow	0.73	0.64	0.69	0.90	0.99	0.73	0.75	0.41	0.69

2. RANK CORRELATION MATRIX: ENTERPRISES 1973

Turnover									
Employment	0.76								
Wage-bill	0.79	0.93							
Net profits	0.79	0.61	0.65						
Cash flow	0.54	0.66	0.69	0.53					
Gross Investment	0.50	0.53	0.55	0.55	0.50				
Equity	0.80	0.71	0.77	0.79	0.57	0.54			
Exports	0.39	0.24	0.22	0.38	0.53	0.26	0.37		
Net assets	0.82	0.76	0.75	0.75	0.55	0.55	0.88	0.33	
Net cash flow	0.82	0.67	0.71	0.89	0.46	0.49	0.82	0.34	0.81

ECONOMIC ACTIVITY UNITS

COEFFICIENTS OF CORRELATION BETWEEN LOGARITHMS OF TURNOVER AND NET PROFITS

(For checking ranking of net profits and turnover: see text p. for reasons why this measure was preferred to rank correlation coefficients).

	Wool	Cotton	Hosiery	Combined sub-sectors
1968	0.753	0.756	0.885	0.735
1969	0.752	0.761	0.872	0.734
1970	0.756	0.772	0.825	0.733
1971	0.765	0.782	0.811	0.739
1972	0.765	0.795	0.808	0.737
1973	0.763	0.805	0.859	0.732

APPENDIX E

ADDITIONAL COMPANY INFORMATION

This Appendix presents in summary form the following information:-

1. Major acquisitions
2. Mergers
3. Financial links between companies
4. Links between Boards of Directors
5. Family ties

1. MAJOR ACQUISITIONS OF COMPANIES WITHIN THE SUB-SECTORS 1968-73 (with reference to more recent developments)

These are listed with the names of the acquiring companies in alphabetical order. The list relates only to the acquisition of companies with annual sales turnover of over £1 million at the time. The date of "acquisition" refers to the year in which a majority holding of equity was obtained.

Name of Acquiring Co.	Name of company acquired	Turnover in Previous Year (£000's)
AGREMIN LTD. (cotton sub-sector)		
1973	Clover, Croft & State Ltd. (spinners)	1215
WILLIAM BAIRD TEXTILES LTD. (cotton and making-up)		
1970	India Mills (Darwen) Ltd. (weaving)	3913
1971	J. H. Buckingham Ltd. (clothing group)	6215
BODYCOTE INTERNATIONAL LTD. (Holding company in clothing and textiles)		
1971	Valdown Jersey Fabrics Ltd. (Jersey knitting)	2078

1971	Philip Brocklehurst Group purchased from Slater Walker Securities (mainly spinning and weaving of man-made staple)	1200 (approx.)

CBR JERSEY (HOLDINGS) LTD.
(Knitted jersey fabrics)

1972	Bellami Knitwear Ltd. (knitted garments)	1837

CARRINGTON & DEWHURST LTD.
(merged into Carrington-Viyella December 1970)

1968	Jersey Kapwood Ltd. (Warp-knitting)	7596

COATS-PATON LTD.

1969	West Riding Worsted & Woollens Ltd. (woollen and worsted spinners, weavers and knitters)	26779
	Dalkeith Knitwear Ltd. (knitwear)	1482
1970	Herbert L. Driver Ltd. (knitwear)	2358
	D. Byford & Co. Ltd. (knitwear)	5107

COURTAULDS LTD.

1968	Prew-Smith Knitwear Ltd. (knitwear)	2700
	Clutsom-Penn International Ltd. (elastomeric fabrics)	19000 (est)
	Contour Hosiery Ltd. (hosiery)	3881
	I. & R. Morley Ltd. (hosiery and knitwear)	4161
	Ashton Bros & Co. Ltd. (cotton spinning and weaving and household textiles)	16033
	Northgate Group Ltd. (knitted underwear)	12000 (est)

	Moygashel Ltd. (rayon and linen fabrics and garments)	22000 (est)
	R. Rowley & Co. Ltd. (hosiery and knitwear)	2000 (est)
1971	C. H. Fletcher Ltd. (woven dress fabrics)	1488
1972	Harwood Cash & Co. Ltd. (cotton and man-made fibre spinning, knitting & weaving)	6310

JOSEPH DAWSON (HOLDINGS) LTD., now DAWSON INTERNATIONAL LTD.

1970	Blackwood Bros	1355
	Braemar Knitwear Ballantyne Sportswear (knitwear)	2500 (est)
	Ballantyne Spinning	

ROBERT GLEW & CO. LTD.

1972	Emu Wools Ltd. (Hand-knitting wools)	2682

ILLINGWORTH MORRIS & CO. LTD.

1968	Winterbotham, Strachan & Payne	4000
1971	Woolcombers Ltd.	25000
	John Emsley Ltd.	3600
	(all in sections of woollen and worsted)	

LONRHO LTD.

1969	David Whitehead & Sons Ltd. (cotton spinners and weavers)	7400

NOTTINGHAM MANUFACTURING CO. LTD.

1973	Lancaster Carpets and Engineering Ltd. (Carpet yarn, carpets and engineering)	15070

SIRDAR LTD.

1972	John C. Horsfall & Sons Ltd. (Hand-knitting wool)	2720

SPIRELLA LTD.

1968	R. Greg (Holdings) Ltd. (cotton spinning and weaving)	4500
1970	Horrockses Ltd.	1680
	Dorcas (Household textiles)	1490
	Stott & Smith Group Ltd.	1830

STROUD RILEY LTD.

1973	James Drummond & Sons	3000 (est)

VANTONA LTD.

1973	Cromer Ring Mill Ltd.	3062

Since 1973

1975 Illingworth Morris acquired majority holding of Troydale Industries Ltd. (see Appendix F).

1975 Spirella acquired almost all equity of Vantona Ltd.

1975 Tootal acquired Trutex Ltd., shirt manufacturer.

2. MERGERS

The principle mergers during the survey period are described in Appendix F because they involve the largest companies. They include:-

(a) The amalgamation of Calico Printers' Association and English Sewing Ltd. to form English Calico Ltd., renamed Tootal Ltd. in 1973.

(b) The merging, financed by I.C.I., of Carrington and Dewhurst Ltd. and Viyella International Ltd. in 1970.

Another merger, not reported in Appendix F, was that which established British Mohair Spinners Ltd. from two spinning concerns in 1969, joined by a third firm in 1970. The combine, with a total turnover of £12.4 millions in 1973 is partly owned by Illingworth Morris and Co. Ltd.

As well as the large mergers which are reported in the text, there have been numerous amalgamations of small firms since 1970 often encouraged by the Department of Industry (or its predecessors). One reason for some mergers has been economy of floorspace, achieved by capital investment and high utilisation through multiple shiftwork.

3. FINANCIAL LINKS BETWEEN COMPANIES

In Section IV, the statistical analysis of concentration, an enterprise has been defined as a separate unit unless a majority of its equity (with voting rights) is owned by another company. (This follows normal U.K. accounting practice.) In most cases the majority holding has been close to 100 per cent.

There are however several companies in both the enterprise and activity unit analyses, which are partly owned by other companies in the sample, by fibre producers or by retail groups. These financial links have been identified from company accounts (English and Scottish law require that a company declare a holding of ten per cent or more of the equity of another company)

and in other cases by a search of lists of members (shareholders) also held at central registries in London and Edinburgh. As far as the second category is concerned, the list below refers only to 1973 and to holdings of at least two per cent. Because there is no published global information with which the detailed results of the search can be compared, the list of links may not be exhaustive (certain equity-holdings may have escaped the attention of the researchers).

(a) Minority holdings by one firm in the textile sub-sectors of the equity of another

Courtaulds Ltd.

(i) Highams Ltd. - holding of ordinary shares built up to 29 per cent by December 1974 (but Government has requested that this be reduced to 25 per cent and that voting power not be used to influence policy).

(ii) Tootal Ltd. - eight per cent of ordinary shares throughout survey period. Courtaulds represented on the board of Tootal until 1974.

Illingworth Morris Ltd.

Pursued a policy of gradual acquisitions throughout period. At 31st March 1974 principal equity holdings were:-

(i) British Cotton and Wool Dyers' Association Ltd. - 36.7 per cent of ordinary shares.

(ii) British Mohair Spinners - 18.4 per cent of ordinary shares.

(iii) Hield Brothers Ltd. - 21.6 per cent of ordinary shares and 5.1 per cent of preference stock.

(iv) George Mallinson and Sons Ltd. - 39 per cent of ordinary shares.*

(v) Troydale Industries Ltd. - 26 per cent of ordinary shares.*

(vi) Yorkshire Fine Woollen Spinners Ltd. - 24 per cent of ordinary shares and 26 per cent of preference stock.

In the analysis of the wool sub-sector firms (ii), (iii), (v) and (vi) have been included as separate units along with Illingworth Morris. The combined sales of Illingworth Morris and these four associate companies amounted to £111 millions in 1973 - 18.5 per cent of the sub-sector total.

(vii) Tootal Ltd. - approximately two per cent of ordinary shares; no board representation.

William Baird Group Ltd.

Joseph Dawson (Holdings) Ltd, now Dawson International Ltd. - 20 per cent of equity 1968, increased to 28 per cent 1970 to date.

Bulmer & Lumb Ltd.

(via company pension fund) John Haggas Ltd. - holding less than one per cent.

(b) Holdings by I.C.I. Ltd.

(i) Carrington-Viyella Ltd. - 64 per cent of ordinary shares but not treated as subsidiary in company accounts because of agreement with government not to use voting power beyond 35 per cent.

(ii) Lister Brothers Ltd. (woollen and worsted) - 20 per cent of ordinary shares. No knowledge of any board representation.

(iii) Tootal Ltd. - eight per cent of ordinary shares with a representative on the board.

(c) Holdings by customer groups

Marks and Spencer Ltd.

(i) John Spencer Ltd., weaving concern - 33 per cent of equity, company liquidated in 1970.

(ii) Corah Ltd., knitwear company selling most of its output to Marks and Spencer - 26 per cent of ordinary shares held by retailers' pension fund.

(iii) Nottingham Manufacturing Co. Ltd. - three per cent of ordinary shares held by retailer.

4. LINKS BETWEEN BOARDS OF DIRECTORS

Individual directors of company (a) are also directors of (b). In most cases and, unless otherwise indicated, company (a) owns part of the equity of company (b).

(a)	(b)
Courtaulds	Tootal
I.C.I.	Carrington-Viyella (2 directors) Tootal
William Baird	Dawson International
Illingworth Morris	Troydale Industries (1974, before acquisition)
Stroud Riley Drummond - No known financial link	Moderna Moderna Ltd. (blanket manufacturers)
U U Textiles - No known financial link	Troydale Industries

5. FAMILY TIES

These cannot be analysed systematically because of problems of identification. Certain family names appear in shareholders' lists e.g. one minor shareholder of Carrington-Viyella is William Baird and a Simon Courtauld is a minor shareholder in Illingworth Morris. These are merely interesting reminders of the long tradition of the textile industry and of the important role of certain families.

Within smaller firms in Lancashire and Yorkshire a number of families were found to have substantial investment in a number of companies which trades as separately. For example almost all the equity of the Oldham Tyre Cord Company (1973 turnover just over £2 millions) is held by one of two brothers who also control four other separate cotton textile companies (not consolidated in the accounts) as well as engineering, warehousing and light aviation concerns. Treated as a single firm, the Dunkerley textile holdings yield an annual turnover in excess of £5 millions.

Historically, many clothing-manufacturing firms in the U.K. were developed by religious minority groups - e.g. exiled French protestants, and, especially in North-West England, Jews. The importance of Jewish families in clothing and in retailing is reflected in family ties between companies - often by marriage. These ties are reinforced in some cases by investments in equity but only of a minor order. There is no evidence that these family ties influence trading by the companies concerned, whichare forced by competitive conditions to trade on "price and quality and nothing else".

APPENDIX F

ANALYSIS OF MAJOR TEXTILE COMPANIES

This section describes each of the five companies which formed an "oligopoly group" in textile processing in 1973; for each there is an analysis of turnover, profits, cash flow and employment set out in the same form to permit comparison. These companies are:

Courtaulds
Carrington-Viyella
Tootal
Coats Paton
Illingworth Morris & Company

A less detailed analysis is presented of three other groupings:

Nottingham Manufacturing Company
William Baird Textiles/Joseph Dawson - 28% of the equity is owned by the William Baird Group.
Vantona/Spirella which were separate companies during the survey period but which were combined in September 1975 when Spirella acquired Vantona.

INTRODUCTION

Because of the integrated structure of the five major groups, inter-group sales account for a large proportion of output at the earlier stages of the production process. In order to identify the importance of each stage of textile processing to a vertically integrated concern, it would be necessary to analyse value added, of which detailed information is rarely published. Analysis of sales to third parties tends to overstate the importance of later stages in production and distribution.

Quite apart from commercial security in this competitive environment, this is a logical reason for the decision by certain of these big groups not to publish a breakdown of sales sufficiently detailed to permit identification of the three sub-sectors. For the purposes of this report, it has been

necessary to produce estimates in such cases. One of the most useful sources for this purpose was a detailed financial analysis of the four largest groups produced in May 1973 by the London stockbrokers de Zoete and Bevan (Ref. 8). Two months of investigation by the Cranfield research team produced results very similar to those of these earlier researchers.

Comparison of financial results is distorted by a number of factors:

(a) Figures of net assets and equity are distorted by inflation because of which the book value of capital is excessively affected by age. Periodic revaluations aggrevate this distortion.

(b) Depreciation reflects the book value of fixed assets and is also affected. This leads to difficulties in comparison of net profits.

(c) Companies differ in the methods whereby they allocate funds for taxation. Because of accelerated depreciation for tax purposes, most companies subtract from net profits an amount representing deferred tax liability, arising from loss of future tax relief. This means some distortion of cash flow figures.

This last element of distortion is probably the least substantial and absolute comparison of the ratio of net cash flow (net profits + depreciation - tax) to sales achieved by different companies is believed to be reasonably valid. Comparisons of ratios involving net profit, net assets, or equity should relate only to variations over time and, even then, the existence of possible distortions should be considered.

Comparative results for five major companies

(a) Growth of sales

Sales turnover figures are, of course, affected by inflation, but the relative growth of different companies may be compared.

	U.K. Textile Sales in £m. 1968	1973	1973 as % of 1968
Courtaulds	228	385	168
Carrington-Viyella	138*	169	122*
Tootal	72+	95	131
Coats Paton	78	136	174
Illingworth Morris	30	83	276
All other firms in textile sample	365	675	185

* Two companies in 1968

\+ Adjusted from 13 to 12 months

(b) Net cash flow as percentage of total company sales

	1968	1969	1970	1971	1972	1973
Courtaulds	9.2	9.2	8.9	11.0	12.0	13.7
Carrington-Viyella	n.a.	n.a.	n.a.	5.5	6.0	7.1
Tootal	n.a.	5.1	5.5	5.4	5.9	6.9
Coats Paton	9.1	7.3	6.8	7.8	8.6	9.7
Illingworth Morris	4.5	4.1	3.9	4.9	6.4	4.7

This table shows the stronger position of Courtaulds which benefits partly from its position in the more profitable activities in man-made fibre production and also from low taxation payments, explained in the section dealing with that company. In the case of Illingworth Morris, the ratio of cash flow to sales is somewhat reduced by the subtraction from net profits of payments to holders of minority interests.

It may be observed that the three companies for which comparable data can be assembled all experienced a loss of profitability in the recession of 1969/70. Further comments on this aspect were presented in Sections IV and VI.

(c) Overseas Activities

In four of the five cases, the proportion of turnover represented by exports and sales by overseas subsidiaries has increased. One main reason for this was the depreciation of sterling which increased the unit value of overseas sales and also, by increasing profitability, gave greater incentive to sell overseas but also permitting companies to adapt competitive pricing policies. Another factor has been the slow growth of the U.K. market combined with price restraint.

Overseas sales (including exports) as % of total

	1968	1969	1970	1971	1972	1973
Courtaulds	36	39	39	40	45	48
Carrington-Viyella	-	-	-	17	23	26
Tootal	40	43	42	47	52	56
Coats Paton	68	67	70	69	71	74
Illingworth Morris*	25	28	28	13	15	14

*Figure fell 1971 onwards because of acquisitions of firms less export-orientated.

1. COURTAULDS

Of all the companies included in this study, Courtaulds Ltd was found to have the largest turnover in the three sub-sectors combined. When its world-wide activities, including the production of man-made fibres, are considered, Courtaulds has the largest turnover of any textile company in the world.[1] The company's world-wide turnover in all products in 1973-4 was £957m, U.K. turnover (including exports) was £717m and the company employed 125,000 in this country.

The company originated in silk manufacture but its growth until the early 1960's was due mainly to its development of cellulosic fibres, viscous rayon and acetate, which the company pioneered in the first quarter of the century. Immediately before the 1939-45 war, Courtaulds entered into an agreement with I.C.I. Ltd. for the establishment of British Nylon Spinners Ltd., with sole British rights to nylon production. During the 1950's the company decided upon a number of policies with the aim of reversing a declining trend in profits.[2] These included (a) commercial development of new triacetate yarns and acrylic fibres, (b) "rationalisation" of the British rayon industry by acquisition of British Celanese and five other rayon firms and closure of certain older rayon plants and (c) diversification into packaging and paints.

By 1960 these policies had pushed profits up to a record level but a subsequent drop in earnings led to a sharp weakening of the company's share price. In December 1961, I.C.I. made a takeover bid, at that time the biggest in British industrial history. This

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1 G. Delanoe: Report on Courtaulds in a series "Analyse des Groupes", DAFSA, Paris, December 1974.

2 Information taken "A Brief History of Courtaulds," published by Courtaulds Ltd., in 1969. Subsequent quotations in the next paragraphs are from this text.

bid failed, leaving I.C.I. at the end of the battle in March 1962 with 38% of Courtaulds equity capital. In August 1964 this holding was exchanged for Courtaulds' 50% interest in British Nylon Spinners and I.C.I. agreed to make a further £10m available over the next five years. Courtaulds used these funds plus the proceeds from the sale of certain other investments to finance (a) the development of its own nylon production and (b) (particularly important in the present context) forward integration into the textile processes which would provide an outlet for its fibres and filament yarns.

In some cases, Courtaulds co-operated with I.C.I. during the period 1963-8 in providing Funds to support major textile groups. In 1963 Courtaulds and I.C.I. both acquired minority holdings in English Sewing Cotton Co. Ltd., (now Tootal, described in 3 below) and in Carrington and Dewhurst Ltd. (see 2 below), though the 10% holding in the latter was sold to I.C.I. in 1968. Until January 1975 one of the directors of Courtaulds was also on the board of Tootal. The more significant growth of Courtaulds' textile interests came about through direct acquisition on which nearly £150m was spent over the six years 1963-9. This left the company with the following approximate share of U.K. output in each stage of production in mid-1968:-

	% of U.K. output (volume)	
Cellulosic fibres production	95	
Synthetic fibres production	25	
Cotton and man-made fibres spinning	30	
" " " " weaving	12	(Filament weaving 22)
Fabric finishing	9	
Textile "converting" (= merchanting)	7	
Warp Knitting	35	
Weft Knitting	15	

Sources: Textile Council, "Cotton and Allied Textiles" (1969), Table 2
de Zoete and Bevan, "The Major Textile Companies", pp. 16-19.

A report by the Monopolies Commission into the supply of cellulosic fibres accused the company of operating against the public interest. As well as proposing tariff reductions and the breaking up of inter-

national cartel agreements, the Commission criticised Courtaulds' transfer-pricing policy and also urged strict Board of Trade control over further textile acquisitions. This restriction was one of the factors limiting the expansion of the company in the three sub-sectors during the survey period.

Courtaulds' share of the combined textile turnover of the firms in the sample (excluding fibre-production) remained at about 22% throughout the period 1968-73. The company makes almost every kind of product within the "cotton industry" and "hosiery and knitwear" ranges and through its subsidiary Henry Lister & Co. also has an outlet for its acrylic fibre in the wool and worsted industry. Expressed as a percentage of turnover, profits on these activities were lower than the average for the industry. De Zoete and Bevan's estimate for 1972-3 was 6.1%, compared with a 1972 average for the total sample of 7.7%. This is misleading because of internal purchase of fibres: taking fibres and textiles together the margin on turnover in 1972-3 was 10.5%.

In its 1974/5 accounts Courtaulds has published a national profit and loss account and balance sheet adjusted for past inflation. This shows that, with this adjustment, shareholders' funds would have represented 60 per cent of net assets in March 1974 and 67 per cent in March 1975. These figures show the company to be highly geared but less so than would appear from an analysis of the statutory figures. Courtaulds' published return on equity (see (c) of the summary table at the end of this sub-section) was 33 per cent in 1973/4, one of the highest in European textiles: the inflation adjusted figure was however only 18 per cent.

A major factor influencing the company's cash flow position has been reduction of taxation partly achieved by inter-subsidiary sales of fixed assets in 1971-2. In addition, the company does not have a deferred tax account (see p.). In the financial years ended March 1973, 1974 and 1975, taxation amounted to only 22 per cent of profits before tax (after interest and depreciation).

The growing importance of Courtaulds as a multinational company is revealed by the growth of sales by overseas subsidiaries from £117m in 1968/9 to £239m in 1973/4. This rise partly reflects inflation and depreciation of the pound but, after correction for these factors, it also indicates that restriction of expansion in the U.K. has encouraged Courtaulds to seek growth overseas. During the course of this investigation Courtaulds have resumed growth in the U.K. textile sector with acquisition of shares of Highams Ltd. Holdings of this company's equity rose from 0 in December 1972 to 10% in December 1973 and 29% in December 1974. With an annual turnover of £18m Highams is one of the U.K.'s largest manufacturers of sheets and bedding and the large investment by Courtaulds provides the fibre manufacturer with a more secure outlet for polyester and cotton yarns.

Post scriptum (September 1975)

Evidence of continued opposition by government to investment by Courtaulds in the textile industry is an agreement following a request by the Office of Fair Trading that the company will reduce its holding to 25 per cent and not use voting power to change policy.

COURTAULDS LTD.

ANALYSIS OF SALES, PROFITS AND CASH FLOW

(i) ANALYSIS OF SALES (£m)

* = estimates	Financial year ended 31st March . . . 1969	1970	1971	1972	1973	1974
"Cotton-type" spinning and weaving*	70	89	85	95	110	135
Woollen fabrics	7	8	11	12	10	12
Hosiery, Knitwear & garments	114	123	139	159	148	169
Other textiles & wholesaling	37	24	31	28	45	69
U.K. Textile Processing	228	244	266	294	313	385
U.K. fibre production	149	155	167	160	180	220
Other U.K. Activities	75	83	83	76	92	112
TOTAL U.K. SALES(1)	452	482	516	530	585	717
Overseas fibres and textiles	77	93	88	93	130	159
Other overseas sales	47	51	55	58	72	80
TOTAL SALES	576	626	659	681	777	956
(1) Includes exports	(81)	(98)	(114)	(124)	(145)	(218)
Exports and overseas sales as % of total	36	39	39	40	45	48

COURTAULDS LTD. (Cont'd)

(ii) ANALYSIS OF PROFITS

(a) Net Profit Before Interest and Taxation (£m)

	Financial year ended 31st March . . .					
	1969	1970	1971	1972	1973	1974
U.K. Textiles (est.)	14.5	14.0	13.7	17.7	20.3	25.2
Company total	61.5	67.0	59.8	64.6	88.3	141.0

(b) Net Profit Before Interest and Taxation as Percentages of Sales and Net Assets

% of Sales						
U.K. Textiles (est.)	6.4	5.7	5.2	6.0	6.5	6.6
Company total	10.7	10.7	9.1	9.5	11.4	14.8
% of net assets	14.9	14.6	11.8	12.2	14.6	20.6

(c) Net Profit after Interest but before Tax

£m	50.9	52.1	42.0	45.5	68.2	116.3
% of equity	23.6	23.2	18.0	18.2	23.7	33.0

(iii) CASH FLOW BEFORE AND AFTER TAX

Before tax	75.3	80.3	73.9	80.5	105.2	158.2
After tax	52.9	57.7	58.3	74.8	92.9	131.3
After tax figure as % of sales	9.2	9.2	8.9	11.0	12.0	13.7

AVERAGE U.K. EMPLOYMENT	135,352	137,819	136,331	128,046	124,038	124,475

2. CARRINGTON-VIYELLA LTD.

This company was formed in 1970 by the merging of Viyella International Ltd. with Carrington and Dewhurst Ltd. The survival of these two companies in merged form was financed mainly by Imperial Chemical Industries. In February 1975 I.C.I. Holdings Ltd. and Imperial Chemical Industries Ltd. jointly owned 64.4 per cent of the ordinary shares of Carrington-Viyella Ltd.

History of Viyella International Ltd.

In 1894 a long-established cotton spinning firm, William Hollins and Company Ltd., registered the trade mark "Viyella" to describe a new fabric manufactured from yarns in which wool and cotton were blended. This new branded cloth proved very successful in shirts and the company developed its own weaving and formed a garment division. By the mid-1950's, all processes from purchase of raw materials to wholesaling of the finished shirts were carried out by the company. It then faced a number of unfavourable developments: loss of exports, excessive reliance on one large retailer who was able to force down profit margins, the growing popularity of man-made fibres in shirts and (allied particularly to the use of nylon) increasing competition from warp-knitted fabrics. In 1961, having failed to negotiate a satisfactory merger with Tootal Ltd. (see 3 below), Hollins decided to diversify by taking over Gainsborough Cornard Ltd. a manufacturer of synthetic yarns and warp knitted fabrics. This takeover was followed by a reorganisation and rationalisation of the company, renamed Viyella International Ltd., under the chairmanship of Mr. J. Hyman.

The growth of Viyella International in the 1960's was directed towards the formation of an international, vertically integrated multi-fibre textile group. This growth was financially assisted from 1963 onwards by I.C.I., which after its failure to take over Courtaulds, was concerned to secure markets for its own output of fibres. I.C.I.'s policy was to assist firms which it considered progressive but without acquiring majority control (unlike Courtaulds) and in 1963 it injected £13m. into Viyella in a combination of

equity and long-term loans.

With this money and with internally generated funds, Viyella International embarked upon a series of acquisitions which increased sales from £8m. in 1963 to £67m. in 1966 and £76m. in 1969. The activities of the companies acquired included cotton and man-made fibre spinning; texturation and weaving; warp knitting- jersey fabrics; branded shirts; other garments; textile finishing; household textiles, furnishing fabrics and tufted carpets.

The weakest part of this vertically integrated group proved to be the traditional cotton spinning and weaving activities. When margins declined in the man-made fibre activities (e.g. texturation) in the late 1960's profits declined and a major managerial crisis developed. In December 1969, in order to ensure the stability of the company, I.C.I. offered to acquire Viyella International with the intention of merging it with Carrington and Dewhurst Ltd.

History of Carrington and Dewhurst Ltd.

This traditional weaving concern turned entirely to weaving of filament artificial fibres in the 1920's and by 1960 was one of Europe's largest weavers of rayon, acetate and nylon filament fabrics.

During the 1960's the company spent £35m. on acquisitions and further sums on modernisation and internal expansion. The process began with funds acquired from the Cotton Industry Act of 1959 and from the infusion of £1½m. in a joint share subscription by Courtaulds and I.C.I. in 1963. Courtaulds did not add any further funds and sold its equity holding in 1968. I.C.I. added continually to its holdings and by 1970 held 17 per cent of the equity, having invested a total of £8m. into Carrington and Dewhurst in a seven-year period.

Carrington and Dewhurst's expansion programme had three elements (all associated with I.C.I.'s desire to secure the continued growth of a market for its fibres within the U.K.). One objective was expansion of filament weaving and by acquisition of two major competitors the company increased its share of U.K. output of woven filament fabrics to 29 per cent by 1968. A second objective was vertical integration forwards from filament weaving to merchant converting, dyeing and finishing and the making up of outerwear from woven filament cloth. A third objective was diversification into texturation of filament yarns, warp-knitting and to a lesser degree, weft-knitting. At the same time the company developed factories in Italy, Belguim and Germany.

A crisis for Carrington and Dewhurst occurred in 1969. Encouraged by the 1969 report of the Textile Council and by I.C.I., the company decided upon a £28m. expansion programme including a £6m. venture for the sale of texturised polyester yarn ("Crimplene") on the German market. A number of adverse developments coincided to bring the company to the brink of financial collapse:- a trade recession at home which led to excess weaving capacity and intensive price competition; chaos in the warp-knitting trade which encountered a decline in sales after a period of uninterrupted expansion; unexpected competition in German where local polyester yarn prices fell by 40 per cent and the French devaluation. Even the British weather turned against the company: a drought occurred just after it had completed an increase in capacity for production of rainwear garments and fabrics. The danger that the company would go into liquidation and that a substantial slice of the U.K. market for synthetic fibres might disappear, forced the intervention of I.C.I. and the merging of Carrington and Dewhurst with Viyella International.

Carrington-Viyella since the merger in 1970

As the analysis of the two former companies has indicated, Carrington-Viyella produces for a variety of final markets. Although an attempt

has been made from analysis of accounts of subsidiary companies to divide textile operations into "cotton" and knitting the breakdown can be regarded as only approximate because some subsidiaries are vertically integrated.

While maintaining a broad technical base (spinning, weaving, weft- and warp-knitting, dyeing and finishing) the new company has curtailed some less profitable operations and specialised on certain successful activities. The latter include the spinning of yarns blended from polyester and cotton and the development of branded products incorporating such yarns:- sheets and pillowcases, shirts and menswear. Vertical integration has been extended in this reorganisation. Contrary to expectations of the late 1960's the main financial difficulties have occurred in texturising (sold to I.C.I. in 1971), weft- and warp-knitting where excess capacity has still (early 1975) not been eliminated.

The market-orientated policy has led to an improvement in profitability as well as substantial expansion of sales. Although 1974 saw a setback in profitability, this was less pronounced than that which occurred in the textile industry as a whole.

The position of I.C.I. in relation to the company is affected by an agreement between I.C.I. and the Government at the time of the merger. Under this agreement, I.C.I. undertook to reduce its shareholding in Carrington-Viyella to no more than 35% as soon as practicable and if this has not been completed within 12 months not to exercise more votes than if it had. The holding remains at 64 per cent, probably because of the generally depressed state of the stock market in recent years and the effect on the price of the shares. The activities of Carrington-Viyella Ltd. are not included in the consolidated accounts of I.C.I. One of the directors of Carrington Viyella is also a director of I.C.I.

CARRINGTON-VIYELLA LTD.

ANALYSIS OF SALES, PROFITS, CASH FLOW AND EMPLOYMENT

(1) ANALYSIS OF SALES (£m)

	Financial year ended 31st December			
	1971	1972	1973	1974
Cotton-type activities	102.0	94.1	99.1	n.a.
Hosiery, knitting and garments	26.0	22.0	39.0	n.a.
Other textiles	14.4	18.0	16.0	n.a.
TOTAL U.K. SALES (all textiles)[1]	142.4	134.1	154.1	168.8
Overseas activities	10.9	21.0	29.4	33.5
TOTAL SALES	153.3	155.1	183.5	202.3
[1] Includes Exports	(15.3)	(14.2)	(18.9)	(22.5)
Exports and o/s sales as % of total	17	23	26	28

CARRINGTON-VIYELLA LTD.

(ii) ANALYSIS OF PROFITS

(a) Net Profit Before Interest and Taxation

	Financial year ended 31st December . . .			
U.K. Textiles (est.)	1971	1972	1973	1974
U.K. textiles (est.)	8.6	9.5	12.8	12.1
Overseas activities (est.)	0.8	1.0	2.6	2.1
Company Total	9.39	10.46	15.37	14.51

(b) Net Profit Before Interest and Tax as percentages of Sales and Net Assets

% of sales				
U.K. textiles	6.0	7.1	8.3	7.2
Company total	6.1	6.8	8.4	7.2
% of net assets (total)	10.7	11.0	14.9	12.5

(c) Net Profit After Interest but Before Tax

£ millions	5.84	7.45	12.11	9.02
% of equity	9.7	12.0	18.1	13.1

(iii) CASH FLOW BEFORE AND AFTER TAX

Before tax	10.66	12.31	17.50	15.28
After tax	8.45	9.29	12.98	11.24
After tax figure as % of sales	5.5	6.0	7.1	5.6

AVERAGE U.K. EMPLOYMENT	32,717	33,543	33,553	34,016

3. TOOTAL LTD.

Until mid-1973 this company was known as English Calico Ltd., which was formed in 1968 by a merger of the English Sewing Cotton Company Ltd. and the Calico Printers' Association. The name Tootal is derived from Edward Tootal one of the forerunners of Tootal Broadhurst Lee and Company Ltd., acquired by English Sewing Cotton in 1963.

English Sewing Cotton Ltd. itself was formed in 1897 as an amalgamation of a large number of Lancashire thread producers concerned about the growing dominance of J. P. Coats Ltd. of Scotland. For many years ESC's thread was marketed by the world-wide Central Agency for sewing threads, which was created and dominated by Coats. With the dissolution of the Central Agency in 1958 ESC became responsible for the marketing of its own thread and at the same time turned its attention towards diversification into other textile products.

The concern of Courtaulds and ICI about the future of the Lancashire cotton industry was reflected in their combined investment of £6m. in ESC in the early 1960's, together with a promise of a further £4m. if required for further development. These funds were used to purchase Tootal Broadhurst Lee and Company, a vertically integrated group engaged in spinning, weaving, knitting, menswear and household furnishings. Further expansions by ESC prior to the 1968 merger were in household textiles, dress fabrics, fine worsteds, industrial fabrics and knitted children's wear.

Evidence suggests that, as with the Coats-Paton group, diversification added little to profits in the short-term and in 1967, the year before the merger, the only profitable product of ESC (apart from minor non-textile interests) was sewing cotton. In 1968 Viyella International proposed a merger with ESC but ESC was already negotiating with the Calico Printers' Association.

The Calico Printers' Association was also formed in the 1890's as an amalgamation of many small firms, in this case engaged in printing of calico ("grey" cotton cloth used mainly for lightweight apparel). Weaving of calico for printing and subsequent export to Asia and Africa was at that time a major activity in central Lancashire but this was the most vulnerable of all cotton textile activities to self-sufficiency and

competition in export markets. Printing, piece-dyeing or bleaching and finishing were less easily adapted in developing countries and in the 1950's CPA's main business was in the application of these processes to imported grey cloth, either purchasing the cloth itself or operating on a commission basis. From this developed a substantial merchanting business. A research department set up to develop new textile finishes, proved more profitable than either industrial processing or merchanting through the receipt of royalties from patent agreements. The most important of these related to "Terylene" (a polyester fibre developed experimentally in 1941).

CPA faced two problems in the mid-1960's: (a) the imminent expiry of patent agreements which accounted for 73 per cent of total profits over the five years 1961-65 and (b) contraction of textile printing as this activity developed in overseas textile producing countries. (CPA assisted this process with its own overseas subsidiaries). Diversification was adopted as a company policy but, as de Zoete and Bevan point out, there was little logical connection between some of the new activities and CPA's existing vertical structure. Acquisitions included retail shops (men and women's fashion wear and department stores), and manufacturers of ladies garment and knitwear, warp-knitted stretch covers and men's shirts.

The merger between ESC and CPA to form English Calico made possible joint development of production and marketing of apparel and furnishing fabrics, the broadening of the range of men's wear products, usage of retail outlets to monitor changes in fashion demand and merging of substantial but complementary overseas interests.

It quickly became apparent that more rapid deterioration in CPA's printing activities would offset improved profitability on the part of ESC. In 1969 Courtaulds announced a bid for English Calico - attracted by a low share price and believed to be interested in acquiring textile finishing, merchanting and retailing. This takeover was aborted by a decision by the Board of Trade opposing any further acquisitions of textile processing on the part of fibre manufacturers.

Between 1969 and 1973 profitability of the English Calico (Tootal) group was increased mainly by reorganisation and rationalisation. Despite the complete elimination of royalties (£683,000 in 1969/70) profits rose consistently.

This profitability was achieved by reduction in calico printing capacity (by about 60 per cent) accompanied by increased productivity, by disposal of certain retailing activities not forming an integrated part of the group's textile interests (a policy pursued with greater vigour during 1974 and 1975) and by further development of branded products in clothing and household textiles.

The most profitable activity remains the production of sewing thread, especially overseas. The summary table shows that, although the profitability of U.K. textile operations was increased substantially during the survey period, it still falls behind that of textile operations overseas, the most significant part of which is the American Thread Company, a long established subsidiary of ESC in the United States.

Courtaulds and ICI continue to hold 8.25 per cent and 8.29 per cent of the ordinary share capital of Tootal. One director of ICI and one of Courtaulds' sat on the board of Tootal until January 1975. (There is no Courtaulds' representation in 1975/6). Although the group, like most textile concerns, has been severely hit by the trade recession of 1974/5, the reorganisation of the 1969-73 period has left it much better equipped to survive these adverse trading conditions.

TOOTAL LTD.

ANALYSIS OF SALES, PROFITS, CASH FLOW AND EMPLOYMENT

(1) ANALYSIS OF SALES (£m)

* = estimates	Year ended January . . . 1969 (13 mths)	1970	1971	1972	1973	1974
Thread and spinning*	16	18	20	20	23	n.a.
Woven Fabrics* and woven household textiles	29	26	26	26	29	n.a.
	45	44	46	48	52	58
Knitted Fabrics, Knitwear and Clothing*	28	25	25	29	30	34
Other Textiles*	5	6	4	4	3	3
TOTAL U. K. TEXTILES	78	75	75	81	85	95
Non-textile activities	30	28	29	25	22	23.
TOTAL U.K. SALES (Includes exports)	108 (14)	103 (16)	104 (16)	106 (19)	107 (19)	118 (24)
Overseas sales (all textiles)	49	49	48	57	76	97
TOTAL SALES	157	152	152	173	183	215
Overseas sales + exports as % of total sales	40	43	42	47	52	56

TOOTAL LTD. (Cont'd)

	Financial year ended January . . .				
	1970	1971	1972	1973	1974

(ii) ANALYSIS OF PROFITS (Because the company was formed during the financial year 1968/9, data for that period are not comparable and are omitted).

(a) Net Profit Before Interest and Taxation (£m)

U.K. textiles	3.9	5.2	6.6	6.4	9.3
U.K. non-textiles	0.6	0.6	-0.1	1.1	1.4
Overseas textiles	4.5	4.6	5.4	7.0	10.6
Total trading	8.98	10.40	11.88	14.47	21.27
Terylene royalties	0.68	0.20	0.03	-	-
TOTAL NET PROFIT	9.66	10.60	11.91	14.47	21.27

(b) Net Profit Before Interest and Tax as percentages of sales and net assets

% of sales

U.K. textiles	5.4	7.4	8.6	7.8	10.0
Non-textile activities	2.5	2.1	-0.2	5.1	6.0
Overseas textiles	10.0	10.0	10.1	9.6	11.4
Company total	6.4	7.0	6.9	7.9	9.9
% of net assets	11.8	12.9	14.7	16.4	21.2

(c) Net Profit After Interest but Before Tax

£millions	7.16	8.17	9.59	12.12	18.34
% of equity	12.3	14.0	16.7	18.8	24.5

TOOTAL LTD. (Cont'd)

(iii) CASH FLOW BEFORE AND AFTER TAX

Before tax	11.44	12.32	13.90	17.03	23.93
After tax	7.70	8.34	9.33	10.70	14.72
After tax figure as % of sales	5.1	5.5	5.4	5.9	6.9

AVERAGE U.K. EMPLOYMENT	27,126	25,106	23,697	20,720	20,001

4. COATS PATONS LTD.

This company's major features are

(a) its predominantly international nature; in 1973 nearly three-quarters of its sales were to customers outside the United Kingdom and 65 per cent were supplied by overseas subsidiaries

(b) specialisation on and a leading supplier of world markets for a limited number of major products, chiefly sewing thread and knitting wool yarns.

The company was formed at the end of 1960 as a holding company for the merger of J. and P. Coats Ltd. and Paton and Baldwins Ltd.

J. and P. Coats is the largest manufacturer in the world of sewing threads, made from cotton and synthetic fibres and sold for both industrial and domestic uses. Profit margins are usually high but vary with the prices of fibres, since consumer prices tend to be less flexible. Coats' strong position in many markets, as well as economies of scale, may explain a margin varying from 13% (1969) to 21% (1973) of gross sales. Long-established overseas subsidiaries account for over 85% of Coats' sales of sewing threads.

Paton and Baldwins Ltd. is the largest worsted spinner of hosiery and hand-knitting yarns in Europe. Hand-knitting yarns account for about half of the output. The company is vertically integrated from wool sorting to yarn dyeing and finishing. Coats-Patons Ltd. also operates a chain of retail shops, which was extended by the acquisition of S. Bellman and Sons in 1966. These market hand-knitting wools (exclusively group) and garments (40% group). Associated companies of Paton and Baldwins Ltd. operate in Australia and Canada.

Since the merger, Coats-Patons Ltd. has extended its activities mainly by vertical integration into textile processes using worsted yarns and sewing threads. Acquisitions have included:-

Knitwear and garments

1965 Coats-Patons acquired majority holding of Pasolds Ltd. leading U.K. manufacturer of children's knitted garments. Total equity was obtained by 1971.

1967 Jaeger Ltd. joined the Coats-Paton group. This company with an annual turnover of about £9m. at the time of acquisition is a major supplier of ladies' knitted and tailored goods.

1969-70 Seven smaller knitted goods companies acquired, with a combined turnover of about £12m.

The author estimates the 1973 turnover of Coats Paton Knitwear companies in the United Kingdom to be about £48 millions and this is equal to about 9 per cent of total turnover in the hosiery, knitwear and weft-knitted fabric industries.

Spinning, weaving and warp knitting

In 1968 Coats-Paton acquired 40 per cent of the capital of West Riding Worsted and Woollen Mills Ltd; a majority shareholding was acquired in 1969 and West Riding Worsted and Woollen Mills Ltd became wholly owned in 1971. This company is itself a broadly-based group including woollen and worsted-spinning weaving and fabric-knitting.

In 1968 the group acquired the textile interests of John Heathcoat Ltd. which manufactures a wide range of warp-knitted and woven fabrics.

Over the period since 1968 the main expansion in Coats-Patons U.K. activities has been in knitted garments and fabrics woven on the woollen and worsted system. The most profitable activity has remained the production (mainly overseas) of sewing thread. (A similar observation was made in the case of English Sewing Cotton, within the Tootal group). In the last reported year (1974) this product accounted for 43 per cent of turnover and 73 per cent of trading profit. In the survey period, overseas activities showed better utilisation of capital and higher profit margins on sales. Average return on capital employed over the years 1968-73 was 6.0 per cent in the United Kingdom and 16.6 per cent overseas. Despite what has been regarded (8) as

a deliberate attempt to diversify and, because of taxation conditions, to derive more profit from U.K. operations, Coats-Paton continues to depend very heavily upon the sales overseas of a narrow product range.

In spite of its predominance in the sewing "cotton" and knitting "wool" industries (both of which now use more synthetic fibres than natural fibres), none of the equity of Coats-Paton (apart from single shares) is held by the major fibre producers.

COATS PATON LTD.

ANALYSIS OF SALES, PROFITS, CASH FLOW AND EMPLOYMENT

(i) ANALYSIS OF SALES

	Year ended 31st December . . .					
	1968	1969	1970	1971	1972	1973
U.K. activities						
Cotton-type spinning	14	15	15	16	17	20
Wool-type activities	34	62	60	58	59	68
Garments and knitwear	30	32	37	41	42	48
Zip fasteners, needles etc.	7	7	7	7	8	11
TOTAL U.K. (including exports)	85 (18)	116 (28)	119 (29)	122 (27)	126 (25)	147 (39)
Overseas activities						
Textile yarns	91	122	133	129	158	187
Knitwear and clothing	2	3	14	17	21	24
Non-textile	32	27	32	35	45	57
TOTAL SALES	210	268	298	303	350	415
Overseas sales + exports as % of the total	68	67	70	69	71	74

COATS PATON LTD. (Cont'd)

(ii) ANALYSIS OF PROFITS

	Financial year ended 31st December . . .					
	1968	1969	1970	1971	1972	1973
(a) Net Profit Before Interest and Taxation						
U.K.	6.7	4.9	3.9	4.9	7.6	13.1
Overseas	18.5	18.5	21.0	26.2	33.0	44.3
COMPANY TOTAL	25.2	23.4	24.9	31.1	40.6	57.4
(b) Net Profit Before Interest and Taxation as percentages of sales and net assets						
% of sales						
U.K.	7.9	4.2	3.3	4.0	6.0	8.9
Overseas	14.8	12.2	11.7	14.5	14.7	16.5
Total	12.0	8.7	8.4	10.3	11.6	13.8
% of net assets	15.2	12.0	11.1	14.2	18.1	22.4
(c) Net Profit After Interest but before Taxation						
£m	23.3	20.4	21.0	26.7	37.4	54.1
% of equity	20.0	16.9	16.1	20.9	26.5	33.9

(iii) ANALYSIS OF CASH FLOW

Before tax (£m)	29.6	28.1	29.7	36.2	47.4	64.5
After tax (£m)	19.1	19.7	20.3	23.7	30.1	40.4
After tax as % of sales	9.1	7.3	6.8	7.8	8.6	9.7
AVERAGE U.K. EMPLOYMENT	29,000	39,000	40,000	35,000	34,000	32,965

5. ILLINGWORTH MORRIS LTD.

(a) INTRODUCTION

Although the company acquired a cotton spinning and weaving firm (Joshua Hoyle and Sons Ltd.) in 1963 and owns two small knitting firms, the vast majority of its turnover is derived from the preparatory processing, spinning and weaving of wool and of man-made fibres on the same system. Since 1968 the company has followed a continuing policy of investment in equity of other woollen and worsted firms gradually acquiring majority holdings. As a result, its share of the total market for woollen and worsted fabrics increased from 4 per cent in 1968 to 10 per cent in 1973, (16 per cent of the wool sample and the largest firm in that sub-sector).

In 1971 it acquired majority holdings in two companies with turnover of nearly £30 millions and as a result of the increased turnover shown in consolidated accounts for the following financial year, it became large enough to form a fifth member of the "oligopoly" group within the textiles industry as a whole.

The company has a number of distinctive features:

(i) a majority of the ordinary shares is held by one family, that of the chairman M. Ostrer;

(ii) the capital structure includes very little long-term borrowing;

(iii) the policy of investment in competing companies leading to acquisitions.

(b) OWNERSHIP OF THE COMPANY

The ordinary share capital consists of £2 millions in voting shares and £4.75 millions in non-voting shares. Of the vote-bearing shares, 46 per cent are held by Mr. I..Ostrer and 35 per cent by Mr. M. Ostrer (who also holds a majority of the non-voting shares). No other major textile company, fibre manufacturer or major customer for textile products has any significant

investment in the company.

(c) CAPITAL STRUCTURE

The company's balance sheet in March 1974 may be summarised as follows:

	£000's		£000's
Issued capital stock	9,709	Fixed assets	17,336
Reserves	13,926	Investments	4,191
Shareholders' funds	23,635	Advance corporation tax	205
Minority interests	3,160	Current Assets	43,366
Long-term loans & debentures	436	Current Liabilities (-)	38,467
	26,631		26,631

The table shows that shareholders' funds amounted to nearly 89 per cent of capital employed. The large figures of current assets and liabilities reflect the high level of inventories (equivalent to 4 months' turnover) financed by bank overdrafts. The complete vertical integration of the company may explain this high level of stock holding.

(d) ACQUISITIONS

Illingworth Morris showed most rapid growth of any of the major companies included in the survey. This growth occurred through gradual acquisition of equity of other firms. Among firms acquired during the period were:

	Date majority Holding acq.(1)	% of ordinary shares, April 1975	(£m) Value at date (1) Equity	Turnover
Winterbottom, Strachan & Payne Ltd. (Woollen & Worsted weavers)	1968	100	2.0	4.0
Woolcombers (Holdings) Ltd. (Preparatory processes in wool & synthetic fibres)	1971	95.6	4.5	25.0
John Emsley Ltd. (Worsted spinners)	1971	100	1.3	3.6

Since the end of the survey period the company has also acquired a majority shareholding in other firms. The only one with a turnover of over £1 million was Troydale Industries Ltd. (mainly woollen and worsteds) with group sales in 1973 of £7.35 millions, mainly in woollen textiles. The holding in Troydale increased from 26 per cent in March 1974 to 96 per cent in March 1975.

As well as the companies in which a majority holding has been acquired, Illingworth Morris has increased its holdings in other enterprises some of which are also included in the wool industry sample of large firms. In April 1975 investments in these companies (at cost) amounted to £3.71 millions and income from these investments in the financial year ended March 1975 was £323,000, 8.7 per cent of the accumulated investment and nearly 20 per cent of Illingworth Morris's net profits.

ILLINGWORTH MORRIS LTD

ANALYSIS OF SALES, PROFITS AND CASH FLOW

(1) ANALYSIS OF SALES (£m)

	Financial year ended March . . .					
	1969	1970	1971	1972	1973	1974
Cotton etc. spinning & weaving	4.1	3.8	3.8	3.4	2.0	2.2
Woollen and Worsted	25.2	26.2	24.3	32.1	63.9	80.2
Knitting	0.6	0.6	0.7	0.5	0.4	0.5
TOTAL U.K. SALES (1)	29.9	30.6	28.8	36.0	66.3	82.9
Overseas sales	-	-	-	0.7	4.1	2.7
TOTAL SALES	29.9	30.6	28.8	36.7	70.4	85.6
(1) Includes direct exports:	7.7	8.5	8.0	10.8	23.4	32.2
" indirect exports:	4.6	4.8	4.5	4.1	5.7	9.1
Overseas sales and direct exports as % of total:	26.0	28.0	28.0	13.0	15.0	14.0

	Financial year ended March . . .					
	1969	1970	1971	1972	1973	1974
(ii) ANALYSIS OF PROFITS						
(a) Net Profit Before Interest and Taxation						
Company total	2.18	2.12	1.64	2.24	6.39	7.97
(b) as % of Sales	7.3	6.9	5.7	6.2	9.6	9.6
as % of net assets			See note (2)			
(c) Net Profit After Interest but Before Tax						
£ millions (3)	1.11	1.06	0.67	1.09	3.75	4.47
% of equity	10.5	9.9	6.1	9.3	25.0	19.4
(iii) CASH FLOW BEFORE AND AFTER TAX						
Before tax	1.88	1.78	1.43	2.28	5.61	5.92
After tax	1.36	1.25	1.13	1.77	4.07	3.93
After tax figure as % of sales	4.5	4.1	3.9	4.9	6.4	4.7
AVERAGE U.K. EMPLOYMENT	10,900	10,700	9,900	11,300	10,500	9,800

(2) This company has an unusual balance sheet: in March 1974 long-term borrowing amounted to £446,000 and minority interests in subsidiaries £3,160,000; bank overdrafts, in contrast, amounted to £25,994,000. Relation of profit before interest to net assets (excluding overdraft) would, therefore, be misleading.

(3) After adjustment for minority interests in partly-owned subsidiaries.

6. OTHER MAJOR COMPANIES

The five companies analysed in detail form a distinct oligopoly group in the textile industries. Ranked by turnover in 1973 the major firms in the three sub-sectors combined were:

	U.K. Textile Turnover £m
Courtaulds	385
Carrington-Viyella	154
Coats Paton	147
Tootal	95
Illingworth Morris	82
Nottingham Manufacturing	48
Joseph Dawson	37
Vantona	37
William Baird	29

(a) WILLIAM BAIRD/JOSEPH DAWSON

William Baird and Co. Ltd. owned 20 per cent of the ordinary shares of Joseph Dawson (Holdings) Ltd. at the end of 1968 and 28 per cent by the end of 1973. The chairman of the William Baird Group is on the board of Joseph Dawson (now renamed Dawson International Ltd.). The turnover of the two companies in 1968 and 1973 can be analysed as follows:

TURNOVER (£m)	1968	1973
Cotton etc. spinning, weaving and making-up into shirts, nightwear and childrens' clothing (Baird)	16.2	29.7
Woollen and worsted spinning and yarn dyeing (Dawson)	15.6	32.9
Knitwear: Baird (interests sold to Dawson in 1969)	3.9	-
Dawson	5.5	16.2
TOTAL TURNOVER IN RELEVANT SUB-SECTORS	41.2	78.8

Whereas Dawson's activities fall almost entirely within yarn production and knitting, William Baird also has interests in chemicals and industrial engineering, overseas mining and investment. Textiles accounted for 52% of group turnover in 1968 and nearly 56% in 1973. Profits over the survey period varied as follows:-

Profit before interest and tax as percentage of sales:-

	1968	1969	1970	1971	1972	1973
William Baird Textiles Ltd.	6.7	4.5	3.6	4.8	4.7	5.1
Joseph Dawson (Holdings) Ltd.*	17.7	17.4	6.1	7.7	13.3	18.6

Profit before interest and tax as percentage of net assets:-

William Baird Textiles Ltd.	24.9	18.7	14.2	16.0	17.6	21.8
Joseph Dawson (Holdings) Ltd.*	27.9	29.8	11.3	10.8	23.7	39.0

* Adjusted for change in accounting period 1970/1.

In the case of Baird, the contrast between margin on sales and return on capital employed is believed to be due to predominance of business with one major customer, Marks and Spencer. This business is of a low-margin, low-overhead nature.

Three knitwear companies were sold by Baird to Dawson in 1969 and this is believed to have contributed to the dip in profit margins experienced by Dawson in 1970 and 1971. Dawson supply major retail customers but are also engaged in the production of more expensive fashion knitwear,which is reflected in the volatility of profits.

(b) NOTTINGHAM MANUFACTURING CO. LTD.

This is the second largest company in the hosiery and knitting sub-sector, accounting for about 8 per cent of sales in that sub-sector by U.K. firms with over 25 employees. Activities include hosiery, knitted garments, weft- and warp-knitted fabrics, dyeing and finishing. In 1973 the firm acquired Lancaster Carpets and Engineering, with a turnover of £15 millions and with tufted carpets the major product. (This research team subtracted turnover and profit figures associated with these activities from Nottingham Manufacturing's accounts in order to derive "economic activity unit" data).

The firm is one of the major suppliers of Marks and Spencer Ltd. with which there are family and financial ties. These include investment by the retailers' pension fund (only about 3 per cent of equity) and holdings of equity by directors and major shareholders in Marks and Spencer. The retailer is not however, represented on the board of the company and sales to Marks and Spencer are believed not be be a dominant proportion of total turnover.

The financial record of the company during the survey period is shown below:-

	Sales Turnover (£m.)	Profit before interest and tax (£m.)	% of sales
	19.9		
1968	19.9	4.4	22
1969	25.3	5.2	21
1970	29.5	5.8	20
1971	33.2	6.4	19
1972	37.4	7.1	19
1973*	63.3	9.2	15

* Including Lancaster Carpets and Engineering (£15m turnover, £1.6m profit before tax).

A declining ratio of profit to net assets is due mainly to inyestment in new assets which, because of inflation and the absence of revaluation, has a distorting effect. Because of the distortion the ratio is not presented here.

(c) VANTONA/SPIRELLA LTD.

Shortly before the completion of this report, major shareholders of Vantona Ltd. accepted an offer by Spirella Ltd. and by the end of September 1975 Spirella owned 91 per cent of Vantona. The combined turnover of the two companies amounts to £70 millions, and the merger will result in another addition to the "oligopoly group".

Vantona Ltd. was in the early 1960's a spinning and weaving group in the Lancashire cotton industry. Acquisitions during the 1960's led to forward vertical integration into selected household textiles, especially bedding and bedspreads. More recent developments include the acquisition of firms producing woven and knitted furnishing fabrics, and a wide range of clothing. In 1973 Cromer Ring Mill Ltd., a large spinning concern with £3 million turnover was acquired. This company was developing production of woven filament fabrics including tyre cord.

The following table shows the turnover and profits of Vantona annually from 1968/9 to 1974/5.

Year ended March	Turnover(£m.)	Net profits before interest and tax £m.	% of turnover	% of net assets
1969	11.5	0.88	7.7	17.9
1970	14.2	1.00	7.0	14.4
1971	16.6	1.05	6.3	15.2
1972	19.9	1.58	7.9	19.2
1973	26.7	2.75	10.3	25.3
1974	38.3	4.12	10.8	28.8
1975	41.1	3.34	8.1	22.1

Spirella Ltd. is probably best known by the brand name for corsetry but as this market has become static, turnover has been expanded by developments in fashion fabrics and (more recently) by acquisition in household textiles. Among major groups acquired are Horrockses Ltd. and Dorcas Ltd. The following tables show levels of turnover in each of the product divisions in recent years together with the overall profit margin.

Sales turnover (£m)

Year ended November	Foundation garments	Fashion fabrics & spinning	Household Textiles	Total
1968	2.78	4.14	-	6.91
1969	4.94	4.55	-	9.49
1970	3.91	4.31	5.86	14.08
1971	3.18	4.85	11.30	19.33
1972	3.30	5.58	11.55	20.43
1973	3.34	8.81	13.61	25.76
1974	3.41	10.34	15.65	29.40

Net profit before interest and tax

	£000's	% of sales	% of net assets
1968	523	7.6	24.0
1969	536	5.6	17.0
1970	923	6.6	13.0
1971	1,268	6.6	14.1
1972	1,548	7.6	17.2
1973	2,114	8.2	22.1
1974	2,600	8.8	21.8

APPENDIX G

CENSUS OF PRODUCTION 1963 and 1968

ANALYSIS OF ENTERPRISES

I. MLH 413 Weaving of cotton linen and man-made fibres

Size group (No. of Employees)	No. of Enterprises	Total Employment	Net Output £m	Net Output per head £m	Capital Expenditure £
1963					
1-24	119	1.5	-	-	-
25-49	66	2.4	1.8	774	0.1
50-99	92	6.7	5.0	756	0.2
100-199	109	15.4	11.4	741	1.0
200-499	81	24.1	19.3	800	1.8
500-999 1000-1999	28	25.0	21.6	866	2.0
2000 and over	5	12.8	12.5	975	3.3
Unsatisfactory returns	29	1.3	-	-	-
TOTAL	529	89.1	74.0	831	8.6
1968					
1-24	111	1.5	-	-	-
25-49	40	1.5	1.8	1150	0.1
50-99	77	5.6	6.5	1166	0.3
100-199	87	12.4	13.5	1087	1.1
200-499	46	13.3	18.3	1375	1.9
500-999 1000-1999	15	11.3	15.1	1330	1.2
2000 and over	4	17.0	22.3	1312	6.2
Unsatisfactory returns	30	1.1	-	-	-
TOTAL	410	63.7	80.7	1266	11.2

APPENDIX G

2. MLH 412 Spinning and Doubling on the cotton and flax system

Size group (No. of employees)	No. of Enterprises	Total Employment	Net Output £m	Net Output per head £m	Capital Expenditure £m
1963					
1-24	97	1.3	-	- (98)*	-
25-49	38	1.5	1.2	847 (40)	0.1
50-99	56	4.0	3.4	870 (58)	0.2
100-199	44	6.6	5.2	786 (55)	0.5
200-499	55	17.6	12.9	735 (82)	1.1
500-999	27	18.6	13.9	746 (65)	1.6
1000-1999	9	12.7	9.8	772 (37)	1.1
2000 and over	8	41.6	29.2	703 (121)	4.1
Unsatisfactory returns	11	0.5	-	703 (15)	-
TOTAL	345	104.3	77.0	-	9.4
1968					
1-24	62	0.8	-	- (62)*	-
25-49	41	1.6	2.2	1330 (42)	0.2
50-99	42	3.1	4.3	1406 (46)	0.8
100-199	30	4.2	4.7	1122 (33)	0.9
200-499	41	13.5	15.4	1143 (57)	2.0
500-999	17	11.9	14.4	1212 (46)	1.3
1000-1999	10	13.3	16.1	1207 (31)	4.6
2000 and over	5	36.9	54.8	1485 (98)	8.8
Unsatisfactory returns	11	0.4	54.8	1485 (13)	-
TOTAL	259	85.6	113.4	-	19.0

* Figures in brackets relate to establishments.

APPENDIX G

3. MLH 414 Woollen and Worsted

Size group (No. of employees)	No. of Enterprises	Total Employment	Net Output £m	Net Output per head £m	Capital Expenditure £m
1963					
1-24	515	5.5	-	-	-
25-49	130	4.9	6.1	1237	0.2
50-99	145	10.1	10.1	993	0.5
100-199	154	21.8	20.2	926	1.2
200-499	133	39.6	40.9	1034	2.6
500-999	39	24.9	28.1	1130	1.9
1000-1999	24	31.1	34.8	1117	2.1
2000 and over	7	37.3	37.5	1007	3.7
Unsatisfactory returns	44	1.9	-	-	-
TOTAL	1191	177.1	185.4	1047	13.1
1968					
1-24	427	4.5	-	-	-
25-49	101	3.8	5.1	1333	0.3
50-99	115	8.2	11.0	1338	0.8
100-199	123	17.9	22.8	1275	1.8
200-499	92	28.0	39.6	1412	3.5
500-999	30	20.1	30.3	1509	2.5
1000-1999	13	17.9	28.0	1561	1.9
2000 and over	9	39.1	54.4	1389	4.1
Unsatisfactory returns	55	1.9	-	-	-
TOTAL	965	141.6	200.3	1415	15.6

APPENDIX G

4. MLH 417 Hosiery and other knitted goods

Size group (No. of employees)	No. of Enterprises	Total Employment 000's	Net Output £m	Net Output per head £m	Capital Expenditure £m
1963					
1-24	389	5.1	-	-	-
25-49	141	5.0	4.5	891	0.3
50-99	151	10.5	10.2	970	0.9
100-199	95	13.5	14.5	1070	1.7
200-499	64	18.3	15.9	869	1.3
500-999	32	21.0	20.1	957	1.7
1000-1999	20	26.7	24.5	918	2.2
2000 and over	5	22.6	21.4	948	2.2
Unsatisfactory returns	40	1.8	-	-	-
TOTAL	937	124.5	117.6	944	10.9
1968					
1-24	374	4.8	-	-	-
25-49	108	4.1	5.7	1398	0.7
50-99	122	8.5	12.9	1526	1.4
100-199	87	12.1	18.6	1529	1.8
200-499	64	19.3	25.1	1297	2.7
500-999	28	18.7	23.2	1240	2.2
1000-1999	15	20.4	30.1	1478	3.6
2000 and over	7	45.6	74.3	1628	10.9
Unsatisfactory returns	62	1.1	-	-	-
TOTAL	937	134.7	198.6	1475	24.5

5. ORDER XIII TEXTILES

Size group (No. of employees)	No.of Enterprises	Total Employment	Net Output £m	Net Output per head £m	Capital Expenditure £m
1963					
1-24	2287	25.9	-	-	-
25-49	605	21.8	21.3	977	1.3
50-99	658	45.9	42.1	918	3.1
100-199	494	70.5	64.4	912	5.5
200-499	404	123.6	116.5	943	11.0
500-999	140	95.4	93.9	985	8.1
1000-1999	72	100.3	99.4	991	8.5
2000-4999	37	115.0	139.0	1209	12.7
5000-9999	8	57.5	53.8	936	3.3
10,000 and over	5	86.1	129.6	1506	14.4
Unsatisfactory returns	-	7.4	-	-	
TOTAL	ϕ	749.3	792.4	1058	70.3
1968					
1-24	1983	22.8	-	-	-
25-49	478	18.0	22.8	1268	1.8
50-99	509	35.8	48.8	1363	4.5
100-199	381	53.2	67.0	1259	6.7
200-499	300	92.6	126.4	1364	12.5
500-999	107	72.7	102.7	1413	10.1
1000-1999	52	69.7	99.3	1423	13.9
2000-4999	29	77.2	132.9	1720	13.3
5000-9999	9	57.3	85.9	1500	7.9
10,000 and over	6	160.1	331.3	2070	50.6
Unsatisfactory returns	-	6.7	-	-	-
TOTAL	ϕ	666.2	1058.3	1588	125.3

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COMMISSION OF THE EUROPEAN COMMUNITIES

A STUDY OF THE EVOLUTION OF CONCENTRATION IN THE MANUFACTURE AND SUPPLY OF TYRES, SPARKING PLUGS, AND MOTOR-VEHICLE ACCUMULATORS FOR THE UNITED KINGDOM

A Report prepared for the
Directorate-General for Competition
of the
COMMISSION OF THE EUROPEAN COMMUNITIES
by

Francis FISHWICK

CRANFIELD SCHOOL OF MANAGEMENT

Manuscript finished in September 1977.

P R E F A C E

The present volume is part of a series of sectoral studies on the evolution of concentration in the member states of the European Community.

These reports were compiled by the different national Institutes and experts, engaged by the Commission to effect the study programme in question.

Regarding the specific and general interest of these reports and the responsibility taken by the Commission with regard to the European Parliament, they are published wholly in the original version.

The Commission refrains from commenting, only stating that the responsibility for the data and opinions appearing in the reports, rests solely with the Institute or the expert who is the author.

Other reports on the sectoral programme will be published by the Commission as soon as they are received.

The Commission will also publish a series of documents and tables of syntheses, allowing for international comparisons on the evolution of concentration in the different member states of the Community.

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INTRODUCTION AND ACKNOWLEDGEMENTS

This report describes an investigation into competition in the supply of certain components for motor vehicles:- tyres, sparking plugs, and accumulators. The study was commissioned by the Directorate for Competition of the commission of the European Communities, and is one of a series of studies undertaken by the Cranfield School of Management and other institutions throughout the European Economic Community.

For the quantitative analysis, the commission specified a number of indices, which were described in detail in the first report prepared by Cranfield in this series, concerned with the United Kingdom Paper Industry. A summary explanation appears in Appendix A to this report.

The author would like to thank colleagues at the Cranfield School of Management who have assisted in this investigation, particularly Elaine Battison, the full-time research assistant until August 1977. The School also wishes to record its appreciation of assistance given by the British Rubber Manufacturers Association, and by three motor manufacturers and some of the companies supplying the three products.

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SUMMARY OF REPORT

SUMMARY OF SECTION 1. GENERAL INTRODUCTION

The market for vehicle components consists of two distinct segments - "original equipment" (OE) and replacement. Within the OE market there is bilateral negotiation of contracts between each of a small number of vehicle producers and each of a small number of suppliers of each component. In the replacement market there are very many ultimate customers many of whom know little about the components and are influenced by recommendations of dealers and by advertising. For some products there is a captive element in the replacement segment. The replacement market generally offers greater profits than the OE sector.

In terms of volume, the replacement demand for tyres is about 2.5 times as great as OE demand. For batteries the ratio is about 2.25 and for spark plugs a figure of 8.0 is estimated. If these ratios were calculated for sales turnover, they would be considerably higher.

The U.K. motor industry is less vertically integrated than those in other countries and over half of the OE sales of components is derived from only ten companies. The three products studied in this report are supplied by separate groups of large companies with multinational interests.

About 37 per cent of the motor industry's output is exported and exports were nearly double the value of imports of motor products in 1976, though imports have increased at a much faster rate than exports in recent years. Parts and accessories accounted for 46 per cent of total exports of motor products in 1976, compared with 30 per cent in 1964; in contrast completed passenger cars continue to be the main element of imports. The trends in trade have adversely affected the U.K. original equipment market for tyres, batteries and spark plugs.

In examining the OE demand for components of passenger cars, we explain the inherent volatility of new registrations. Superimposed upon the fluctuations in sales has been a downward trend reflecting the increased penetration of imports and the decline in car exports.

The replacement demand for certain car components is negatively related to new car demand. Sales of batteries and tyres are mainly for vehicles aged at least two years old. A period of economic hardship can lead to postponement of vehicle scrappage which may benefit replacement demand for components.

There have been substantial changes in the stock, utilisation and patterns of replacement of goods vehicles over the past few years, in spite of the continuing stable relationship between tonne-kilometres of freight and Gross Domestic Product. One of the most significant changes is the use of larger vehicles, which has led to lower utilisation of smaller vehicles, extended lives and a lower total of new registrations. Lorries with unladed weight of 8 long tons (1018 kilograms) or more accounted for 59 per cent of freight movement in 1975 compared with 19 per cent in 1968. Despite a recovery in exports, from a low figure in 1972, total production

od goods vehicles has declined annually from 1969 (443,000) to 1976 (339,000).

The annual utilisation of goods vehicles is about 60 per cent greater than that of cars (the 1975 averages were 13,800 km. for cars and 22,100 km. for goods vehicles). For tyres replacement sales for goods vehicles are a particularly important market segment.

SUMMARY OF SECTION II, TYRES

The total market for tyres was static for much of the period surveyed. Total production of new car and commercial vehicle tyres fell annually from 1972 to 1975, in the replacement market this was due to slow growth in car ownership, to a decline in average distances travelled per car and to progressive adoption of radial tyres with longer life. Radial tyres plus the switch to larger vehicles for longer distance work explain a static replacement demand for commercial vehicle tyres. For both commercial vehicles and private cars original equipment demand has contracted partly because of a decline in vehicle production since 1972 and partly because more car tyres are being supplied from overseas sources to complement c.k.d. exports.

In terms of constant (1975) purchasing power, the total value of sales of tyres fell from £491 millions in 1968 to £449 millions in 1972 and the 1975 figure was £445 millions. The decline in the real value of sales shows that the fall in volume was not compensated by an increase in the prices of tyres in relation to the prices of all goods and services. Although the ex-factory prices of radial tyres are now over 20% higher than those of corresponding cross-ply tyres, the average life of radials is approximately double that of cross-ply tyres.

A large growth in imports and exports partly reflects intra-European movements by multinational companies. By 1975 European countries received 70 per cent of exports and supplied 88 per cent of imports. Competitive imports (that is supplied by companies other than members of the six large tyre companies with production units in Britain) accounted for about 15 per cent of new car tyres bought in the U.K. replacement market in 1975 and about the same proportion of new commercial vehicle tyres.

Direct exports of car tyres represented 25 per cent of U.K. production in 1975, having increased annually from 1972 to 1975 and almost recovered their 1970 volume. Most of these tyres (75 per cent by volume and 84 per cent by value) are exported to European countries and the leading export markets are countries to which British vehicle parts are sent for final assembly. Such countries, especially Sweden, were also important markets for goods vehicle tyres, exports of which rose sharply both in volume and average value in 1975. Direct exports accounted for 37 per cent by volume and 34 per cent by value of the total output of commercial vehicle tyres in 1975.

In 1968 there were seven companies manufacturing new vehicle tyres in the United Kingdom; with the financial merging of the tyre activities of Dunlop and Pirelli, the number fell to six. There are about 70 companies engaged in the retreading of used tyres; most of them are too small to be included in official statistics. Retreaded tyres represented about 28 per cent of replacement tyres on cars in 1975 but the proportion had fallen. For commercial vehicles, retreads were more significant - 38 per cent in 1973 and 42 per cent in 1975. About 35 per cent of all retreads are supplied by the major manufacturers. On page 30 we have listed some competitive disadvantages faced by independent retreaders, which have led to downward pressure on prices.

Manufacture-owned outlets supplied 35 per cent of all tyre sales to final customers in the replacement market in 1975. A further 30 per cent were supplied by independent dealers, some of whom had contractual arrangements with manufacturers. The number of independent distributors is large and competition in the retail distribution of tyres is intense.

In the replacement market the competition extends also to manufacturers. Car tyres are a volume product:- six size - categories account for 75 per cent of all tyres sold and 25 per cent are of a single-size. Brand loyalty is low. Competition has taken the form of quality improvement (which has led to longer product-life and lower sales), advertising, multiple-branding and price-cutting. Advertising, in terms of constant purchasing power, was 37 per cent lower in 1974 than in the previous year but there have been recent indications of a recovery, Even in 1976 advertising expenditure by all tyre manufacturers amounted (in terms of constant purchasing power) to only 52 per cent of the 1969 figure. In 1976 advertising amounted to about 22 pence per tyre, or about 3 per cent of the ex-factory price. Multiple-branding is used as a method of market segmentation and perhaps also as a defence against imports. In the absence of detailed empirical work into the structure of prices, the degree of price competition is hard to determine. The size of discounts offered at some outlets suggests that part of these discounts must be borne by manufacturers.

Estimates of market shares in 1972, 1975 and 1976 replacement sales of new tyres show gains by Michelin and an unstable pattern for other producers. Four companies (Dunlop-Pirelli, Goodyear, Michelin and Firestone) achieved 79 per cent of replacement sales in 1972 and 84 per cent in 1976.

The original equipment market for tyres is volatile partly because of interruptions in vehicle production and also because of the very low level of inventories held by vehicle manufacturers: for most individual size/specification they use two (but only two) sources. Certain links between individual vehicle manufacturers and tyre producers continue to be reflected in the OE market - Leylandwith Dunlop, Ford with the American suppliers etc. Although there is no evidence of collusion, proposals for increases in prices, which are bilaterally negotiated, appear to coincide and differences in prices are very small.

From our own discussions and the results of other surveys, we estimate that Dunlop, Goodyear and Firestone together supplied 76 per cent of the OE tyres for cars and commercial vehicles in 1975. The ex-factory price of a tyre sold for replacement is estimated to be about 1.5 times the OE price.

The most of the financial analysis and all of the concentration tables are confined to the larger firms, though the performance of three retreading companies is examined. There are three levels world-wide and all activities world-wide.

The analysis for all U.K. activities shows that even within the six major companies, a group of three (Dunlop/Pirelli, Goodyear and Michelin) formed a distinct oligopoly group, in 1974 and 1975. In the latter year they obtained 82 per cent of the combined sales of the six firms. The Linda index, which is used to define this group, also shows that in each year there was a discontinuity in the distribution of profits,

Analysis of profitability is distorted by questions of transfer-pricing relating to subsidiaries of overseas parents. Consolidated accounts for world-wide activities of Michelin were first published in 1975 and only for that year is a complete comparison possible. Ratios for other companies in remaining years are presented in the tables.

The examination of "dynamism" within the U.K. activities reveals increased instability towards the end of the survey period. This appears to be due to resurgence of advertising to which not all companies had joined. Over the entire period 1969-75 the growth of Michelin's share of industry turnover is the most notable feature.

From the application of the standard statistical measures prescribed by the Commission to world-wide activities, it is clear that the British company Avon cannot be regarded as a member of the multinational oligopoly. The analysis also shows that net profits and net cash flow were more strongly concentrated than sales turnover and capital stock variables, a conclusion which corresponds with the results of most of this series of studies initiated by the Commission.

SUMMARY OF SECTION III. SPARKING PLUGS

Apart from certain specialist producers, there are now only three manufacturers of sparking plugs in the United Kingdom - the Champion Sparking Plug Company, A.C. Delco (General Motors) and Ford. Each is a subsidiary of a U.S. parent. A.C. Delco supplies plugs to its fellow General Motors subsidiary, Vauxhall, and the OE requirements of the Ford Motor Company are supplied by its own sparking plug division. Champion is the sole supplier to British Leyland and Chrysler.

Total U.K. production of sparking plugs is estimated to have risen from 94 millions in 1968 to 112 millions in 1973, but with the decline of car and small van production, output fell back to about 94-95 millions in 1974 and 1975.

Foreign trade in plugs is quite large in relation to production, partly because of shipments by the three major manufacturers, who tend to organise their activities on a "pan-European" basis. Competitive imports, mainly from Germany, Japan and France accounted for about 11 per cent of the U.K. market in 1975.

The ratio of replacement to OE demand for sparking plugs was about 8 to 1 in 1973 and about 10.5 to 1 in 1975. The OE market is effectively tied with exclusive dealing arrangements betweeen vehicle manufacturers and suppliers of sparking plugs. We estimate that Champion held 66 per cent of the OE market in 1975, Ford 26 per cent and A.C. Delco 8 per cent.

Competition in the replacement market is influenced by links between manufacturers and major outlets. Customer loyalty is believed to be low and advertising is negligible. Our estimates of market shares in the replacement sector are as follows (%):-

Champion 65, Ford 13, A.C. Delca 12, Bosch 6, and other importers 4.

SUMMARY OF SECTION IV. BATTERIES (ACCUMULATORS)

Revenue from the sale of batteries has fallen in real terms since 1973. This is mainly because of improved product life: the number of accumulators sold per 100 vehicles at least two years old fell from 43 in 1973 to 33 in 1976.

The total market may be divided into three main segments:- (i) original equipment, for which "premium" or high quality batteries are supplied, 94 per cent of them by Lucas and Chloride; (ii) the "traditional" replacement market where premium and "second-line" batteries (the latter have less exacting specifications) are supplied via garages by the four members of the British Battery Makers Society (Lucas, Chloride, Haddon-Oldham and Crompton-Parkinson) and (iii) the "own label" market where batteries of varying qualities and specifications are sold by distributors under their own brand-names.

The third sector has grown in recent years; there are mahy brand-names and a large number of suppliers. These are believed to include not only the major battery companies but also local producers often with only a handful of employees. Some of the batteries in this third sector are sold at prices much lower than those of batteries sold via traditional outlets.

Foreign trade in batteries is very small. In 1976 less than 9 per cent of U.K. production volume was exported and imports amounted to less than 6 per cent of batteries sold in this country.

Original equipment accounts for 25 to 30 per cent of all motor vehicle batteries sold. This sector of the market is dominated by Lucas and Chloride, with over 90 per cent of all sales. Some traditional supply patterns, e.g. between Leyland and Lucas and between Ford and Chloride continue.

In the replacement sector, the multiplicity of outlets and of brand-names is described in some detail in the report. Advertising is negligible and brand-loyalty very low. Estimates of market share must be inexact because it is not possible to identify the suppliers of certain brands.

We estimate that Chloride and Lucas shared 94 per cent of the OE market in 1975, probably with about 42 and 52 per cent respectively. In the replacement market our estimates of market share (%) are Chloride 35, Lucas 17, Haddon-Oldham 13, Crompton-Parkinson 10, others (including importers) 25.

Contents

		Page
Section I	GENERAL INTRODUCTION	
	A. The total market for vehicle components in the U.K.	1
	B. The relative size of the replacement and original equipment markets	2
	C. The structure of the U.K. motor industry	6
	D. Foreign trade	7
	E. Components for passenger cars - original equipment	9
	F. Components for passenger cars - replacement demand	11
	G. Goods vehicles	12
	H. Buses and coach operators	16
Section II	TYRES	
	A. Analysis of total market	17
	1. U.K. sales of tyres for cars	19
	2. The U.K. commercial vehicle market	22
	3. Direct trade	
	(a) General	23
	(b) Direct imports and the U.K. market-passenger cars	24
	(c) Direct imports - commercial vehicle tyres	25
	(d) Direct exports	26
	B. The structure of the industry	
	1. Numbers of companies manufacturing each product within the U.K.	27
	2. Retreading (and remoulding)	29
	3. Distribution of tyres to the replacement market	31
	4. The nature of competition in the replacement market	32
	(a) Quality	33
	(b) Advertising	33
	(c) Brand names in the distributive market	35
	(d) Price competition in replacement market	36
	5. Market shares in the replacement segment	37
	6. The original equipment market	37
	7. Relative profitability of OE and replacement market	40
	C. Financial analysis and concentration tables	40
Section III	SPARKING PLUGS	
	A. Analysis of total market	80
	B. Foreign trade	81
	C. The original equipment market	83
	D. The replacement market	85
	E. Financial Statistics	87
	F. Statistical summary of concentration	89

		Page
Section IV	BATTERIES (ACCUMULATORS)	
	A. Introduction	90
	B. Analysis of total market	91
	C. Foreign trade	93
	D. The original equipment market	94
	E. Replacement sales	95
Appendix A:	Definitions and basic properties of concentration indices	102
Appendix B:	Profile of major companies in the three sub-sectors	108
References and sources		119

GENERAL INTRODUCTION

A. THE TOTAL MARKET FOR VEHICLE COMPONENTS IN THE UNITED KINGDOM.

For the three products examined in this report, as for most motor vehicle components, there exist two distinct market segments:- original equipment and replacement. In selling components for use on new vehicles ("original equipment" or OE), a small number of large companies is normally competing for orders from the few major vehicle manufacturers in the United Kingdom. In terms of economic theory, an oligopoly faces an oligopsony. This results in competitive negotiations, shrouded in commercial security, and in the establishment of 'certain' regular buying patterns, the reasons for which are not easy to discern. A general survey of the dealings between component manufacturers and vehicle products suggests that some of these established links have become accepted by the industry because they reduce uncertainty and create some stability within the original equipment market.

The sale of components for the replacement on existing vehicles of products which are worn out or damaged is very different from the sale of the same products as original equipment:-

1. There is a very large number of ultimate customers, in contrast with the dominance of four major vehicle manufacturers in the OE sector. There are thousands of intermediaries between the component manufacturers and vehicle users.

2. Most of these final customers know little about the technical properties of the product and in most cases rely on the advice of motor repairers and distributors. Advertising influencies the market for some products and, especially where safety is involved, surveys have revealed fairly low price-sensitivity.

3. With some products there is a "captive" element in the replacement market. Even when this is not necessary for technical reasons, the customer tends to replace certain components with the same branded product which was used for original equipment. This may be because the vehicle is serviced by the dealer who sold it to him or because of uncertainty about possible substitutes.

4. These first three features make the replacement segment of the market more profitable than the original equipment segment. This has led to (i) the establishment of companies who sell only to the replacement segment (these were described as "pirates" by the large oligopolists);(ii) the production, by all major component manufacturers, of replacement parts for vehicles for which they do not sell the corresponding OE part - this includes vehicles imported into the United Kingdom and even non-British vehicles in overseas markets; (iii) the establishment by three of the vehicle manufacturers of wholesale distribution under their own brand-names of components and accessories[1] purchased from component suppliers.

B. THE RELATIVE SIZE OF THE REPLACEMENT AND ORIGINAL EQUIPMENT MARKETS.

The comparative size of the two segments of the market depends upon the life of the vehicles, the distances they travel, the rate at which the component deteriorates, the risk of damage to the component and the number of vehicles registered. The importance of these factors varies between components.

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1 The word "accessories" is used to describe something which is normally added to the vehicle and is not an essential compenent. The words "components" and "parts" are used here synonymously although they may have different connotations in every day use.

1. TYRES

The average new cross-ply passenger car tyre may be expected to cover about 22,000 km before requiring replacement and the average new radial-ply tyre about 45,000 km. The share of radials in the total market was 62 per cent in 1973 and 69 per cent in 1974, so that the mean tyre life in 1974 would be about 38,000 km. In 1974 the 14.3 million cars and car-derived vans in the U.K. covered a total distance of about 195,000 million km, indicating a replacement requirement of (195/38 times four) about 20.5 million tyres. This expected figure was remarkably close to the actual figure[1].

The original equipment market for passenger car and van tyres may be somewhat less than five times the number of cars and small vans produced in the country (that is in 1974, 5 times 1.627 millions = 8.134 millions). This is because the production figures include cars exported in unassembled form (327,000 cars in 1974 representing 58 per cent of cars exported); tyres fitted to such vehicles are often purchased from overseas sources, including firms affiliated to the main U.K. tyre producers.

For tyres, the ratio of total U.K. replacement sales to OE sales is therefore about 5 to 2 in terms of volume. Because of the higher prices of tyres sold for replacement their relative importance in terms of sales turnover is even greater. With commercial vehicles, undertaking greater distances, the ratio is almost certainly more pronounced.

2. BATTERIES (accumulators)

The life of a battery is influenced partly by age and partly by its use and care in its maintenance. Battery

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1 Source of data on vehicle numbers and kilometres travelled: Department of Enviroment. The actual figures of tyre sales are shown on page 19 below.

deterioration is not strongly related to vehicle mileage as such.

Over the past few years this life has been extended by technical improvements in the battery itself, e.g. the use of polypropylene casing instead of rubber and in alternators, giving better charging; other factors which may have been important are the relaxation of rules for the lighting of parked cars and a series of mild, comparatively fog-free winters. The effects of these changes are hard to quantify even for companies within the industry.

Foreign trade in batteries is fairly small and most of the vehicles exported in unassembled form will have batteries from overseas suppliers. Original equipment sales are, therefore, likely to be equal approximately[1] to the sum of U.K. cars and commercial vehicle production less unassembled exports. In 1974 this total was 1.8 millions and with the total sales of batteries in the United Kingdom at about 5.9 millions, this suggests a replacement market of 4.1 millions. With a total vehicle stock of 15.9 million cars and commercial vehicles, this indicates an average life per battery of about 3 years 10 months[2].

As with tyres, the replacement market is more than double the size of the OE market for accumlators. In terms of volume the current ratio is about 9 : 4; in terms of sales value, the ratio is much higher.

3. SPARKING PLUGS

Sparking plugs are normally replaced after about 19,000

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1 This calculation ignores the use of two batteries by very large commercial vehicles.

2 The estimate of the replacement market is almost identical with one reached independently by the Economist Intelligence Unit Ltd. (Ref 1.)

kilometres. With about 15 million petrol-driven cars and vans in use in 1974, with an average distance travelled of about 14,300 kilometres, this suggests a replacement market of about 50,000 plugs (assuming an average of about 450 plugs per 100 vehicles). A further 6-7,000 may be added for plugs used in motor-cycles, motor-mowers, agricultural vehicles etc.

The original equipment market is proportional to the number of vehicles produced, less most of the unassembled units exported. For petrol driven vehicles in 1974 this total was about 1.5 million vehicles, or about 6.8 million plugs.[1]

In the case of sparking plugs, this calculation suggests that the replacement market is approximately eight times as large as the original equipment market, in volume terms. The OE market is regarded as important by the principal manufacturers of sparking plugs because there is likely to be some brand loyalty, especially during the first year of a vehicle's life when the validity of guarantees relating to the ignition equipment is considered. Because plugs are a fairly minor cost item, the customer may feel it wise to replace plugs with identical brands to avoid more significant problems.

4. SUMMARY OF SECTION

For the three products considered in this study the United Kingdom replacement segment of the market is much larger than the original equipment segment. Apart from the value of any contribution to fixed expenses achieved by selling at prices greater than marginal costs, one of the main motives for manufacturer to sell to the vehicle builders is the entry that this gives to the more profitable replacement sector.

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1 These estimates are consistent with those of the E.I.U. and of one of the spark plug manufacturers.

C. THE STRUCTURE OF THE U.K. MOTOR INDUSTRY

TABLE 1.1 ANALYSIS OF GROSS OUTPUT 1974

(a) ANALYSIS BY PRODUCT		£ Millions	Percentage of Total
Passenger cars:	Home sales	1,325	38.0
	Exports	420	12.1
Commercial Vehicles:	Home sales	385	11.0
	Exports	230	6.6
Parts and Accessories (other than those included in vehicles shown above)			
	Home sales	445	12.8
	Exports	680	19.5
		3,485	100

(b) ANALYSIS BY SOURCE OF ADDED VALUE		
By vehicle manufacturers	745	21.4
By component producers[1]	625	17.9
By organisations outside the motor industry	2,115	60.7
	3,485	100

Source: Central Policy Review Staff (Ref.2).

This table shows the importance to the motor industry of parts and accessories (other than those incorporated in complete vehicles). These accounted for over 32 per cent of total industry sales in 1974 and for over 51 per cent of industry exports. The significance of foreign trade for components in general and for tyres, batteries and sparking plugs in particular is discussed in Section D.

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1 Component producers include all enterprises with no vehicle manufacturing capacity but with establishments devoted primarily to motor vehicle components.

In contrast to those in other countries, the British motor industry has little vertical integration. Whereas value added by the vehicle manufacturers accounted for only 30 per cent of sales, the corresponding proportion for German verhicle builders was around 47 per cent[1]. A distinctive feature of the U.K. motor industry is the existence of large component manufacturing groups. Although there are over 2,000 companies within the component sector, ten of these account for over half of the total value of the OE market for components[2].

In the production of tyres, batteries and sparking plugs, large firms with multinational interests predominate and only these large companies are involved in the OE segment. These are as follows:-

Tyres:- Dunlop, Pirelli, Michelin, Avon, Firestone, Goodyear, Uniroyal.

Batteries:- Chloride and Lucas.

Sparking plugs:- Champion (the only source for Leyland and Chrysler), A.C. Delco (the only supplier to fellow GM subsidiary, Vauxhall Motors Ltd) Autolite (sole supplier to and division of Ford).

D. FOREIGN TRADE

Table 2 shows the composition of U.K. trade in 1964 and in each of the five latest years for which data are available, 1972 to 1976.

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1 Estimate by author based on data published by Verband der Deutschen Automobilindustrie: Tatsachen und Zahlen and also an analysis of company accounts for an earlier research project.

2 C.P.R.S. (Ref. 2), page 7.

TABLE I.2 U.K. TRADE IN PRODUCTS OF THE MOTOR INDUSTRY

(Wider definition than in Table I-1)

	1964	1972	1973	1974	1975	1976
EXPORTS (£m.f.o.b.)						
Cars and taxis:						
assembled	174.4	213.5	234.4	270.6	315.3	454.7
unassembled	81.2	116.4	138.3	147.9	167.9	176.3
Goods Vehicles complete		114.7	131.0	168.0	297.0	375.9
chassis	126.5	17.1	31.9	14.9	24.2	26.4
Other commercial vehicles		43.3	51.2	67.1	107.4	145.9
Parts & Accessories	224.3	576.8	703.2	859.4	1151.5	1503.8
Tractors, Dumpers and other products	136.3	237.3	278.7	348.3	531.4	596.5
TOTAL EXPORTS	742.7	1319.1	1568.7	1876.2	2594.7	3279.5
IMPORTS (£m.c.i.f.)						
Cars and taxis:						
assembled	27.1	324.3	436.9	355.0	513.8	871.0
unassembled		0.1	-	0.1	0.2	15.4
Commercial vehicles	2.2	39.0	53.7	91.1	90.1	122.7
Parts & Accessories	13.0	169.4	224.6	301.6	359.6	552.1
Other products	15.9	29.6	49.3	70.0	126.4	110.2
TOTAL IMPORTS	58.2	562.4	764.5	817.8	1090.9	1671.4

Source: SMMT and Overseas Trade Accounts.

From the data in this table it can be calculated that, whereas in 1964 parts and accessories accounted for 30 per cent of total U.K. exports of motor industry products, by 1976 the proportion was nearly 46 per cent. This has been due partly to the transfer to overseas sources of purchases of parts for British vehicles assembled overseas. When the ratio of the U.K. content of such vehicles to their complete ex-factory value falls below 50%, the vehicle is no longer included in the "unassembled vehicles category" and the components exported from the United Kingdom are classified as parts and accessories. Among "unassembled vehicles"

included in the count, the U.K. content has fallen significantly, Within the 1601-2,200cc category, for example, in 1965 the value of the unassembled car exported was over 70 per cent of the corresponding value of the completed vehicle; by 1975 this ratio had fallen to 61 per cent.

While completed "passenger cars" represented under 14 per cent of U.K. motor industry exports in 1976 (and only 12 per cent in 1975), they continue to be the main element of imports, 52 per cent in 1976. The assembly of foreign vehicles in this country is confined to the recently introduced arrangements for the Chrysler Alpine.

The trends in trade have adversely affected the U.K. OE market for tyres, batteries and spark plugs. These products are usually among the first items to be supplied from sources in or near the country of assembly when vehicles are exported from the U.K. in unassembled form. The OE sector has also been reduced by the increased penetration by imported cars and commercial vehicles (nearly all in completed form) of the United Kingdom market.

E. COMPONENTS FOR PASSENGER CARS - ORIGINAL EQUIPMENT

1. NEW REGISTRATIONS OF PASSENGER CARS

Figure I shows new registrations of passenger cars in each year from 1960 to 1975. The volatile nature of demand can be explained partly by major changes in the economic environment:- alternation of expansionary and restrictive policies by governments in the 1960's which tended to control demand for consumer durables as a means of regulating the economy; the rapid growth of the U.K. economy in 1972-3 and the effects of recession after the rise in oil prices. Purchases of new cars are likely always to be highly sensitive to changes in aggregate income because of the "stock adjustment effect"[1]. Current research by the present author has shown that new registrations (Q) are related to personal disposable income (Y) and the ratio of an index of new car prices to the overall index of retail prices (P) by the following equation (which relates to Great Britain):-

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1 The theoretical basis of this concept was set out in a paper by Stone and Rowe in Econometrica 1958. See also C StJ.O'Herlihy: The Demand for Cars in Great Britain, Applied Statistics 1965.

$$Q = 959 + 0.034\ (Y + 4\ \Delta Y) - 10.48P \qquad R^2 = 0.927$$
$$\quad (365)\ (0.004) \qquad\qquad (2.48) \qquad DW = 2.12$$

Estimates predicted by the equation are shown alongside actual new registrations for 1960 to 1975 in Figure I. (At end of section)

Forecasts of new registrations in any future year are inevitably hazardous. Most[1] new cars are purchased to replace existing vehicles which are then transferred to new owners. Postponement of replacement during a recession leads to a potentially larger demand in a subsequent year; above-normal replacement leads to a rejuvenated car stock and so to a lower level of subsequent demand. Although the stock-adjustment model takes this feature into account, it requires prediction of year-by-year changes in economic activity. New car registrations and consequent OE demand for components will remain very difficult to predict.

2. U.K. PRODUCTION OF PASSENGER CARS

Because of the increased penetration of the U.K. market by importers (14 per cent in 1970, 33 per cent in 1975 and 45 per cent in 1976) and the decline in exports of vehicles, annual production of cars has only once (1972) exceeded its 1964 level:-

TABLE 1.3 PRODUCTION OF PASSENGER CARS IN THE U.K.

(Department of Industry)

YEAR	No. of cars produced (000's)	YEAR	No. of cars produced (000's)
1960	1353	1969	1717
1961	1004	1970	1641
1962	1250	1971	1742
1963	1608	1972	1921
1964	1867	1973	1747
1965	1772	1974	1534
1966	1604	1975	1268
1967	1552	1976	1333
1968	1815		

1 The Motor Transactions Survey of 1971 showed that the proportion was then 92 %. With the greater current level of motorisation, the proportion is almost certainly higher.

For producers of certain components, the demand from the OE sector is overstated in Table 1.3. because the production figures include incomplete vehicles exported overseas in unassembled form. Tyres, spark plugs and batteries may not be included in all of these unassembled vehicle units.

F. COMPONENTS FOR PASSENGER CARS - REPLACEMENT DEMAND

In section B we listed some of the factors which influence the replacement demand for the three component products. These will be examined in further detail in Sections II to IV. It is clear that replacement demand will not be proportional to the total number of cars in use, nor to the total distance covered by passenger cars. For tyres (especially with the growing importance of radials) and batteries, replacement during the first two years of a car's life is exceptional. Table 4 shows the number of passenger cars in use in Great Britain[1] in September of each year annually from 1961 to 1976 and also the number aged two years and over. These data are shown graphically in Figure II.

TABLE 1.4 PASSENGER CARS IN USE IN GREAT BRITAIN 1961-76

	Grand total	of which at least 2 years old
1961	5,979	4,379
1962	6,556	5,154
1963	7,375	5,670
1964	8,247	6,112
1965	8,917	6,589
1966	9,513	7,242
1967	10,303	8,169
1968	10,816	8,660
1969	11,227	9,063

1 Great Britain is used instead of the United Kingdon because of incomplete data for Northern Ireland. The total numbers of cars licensed for use in Northern Ireland were (thousands):-
1961 : 135 1971 : 299 1976 : 316

	Grand total	of which at least 2 years old
1970	11,515	9,436
1971	12,062	9,801
1972	12,717	9,892
1973	13,497	10,166
1974	13,639	10,637
1975	13,747	11,251
1976	14,029	11,703

It is interesting to compare the growth of cars aged two years and over with new registrations. For example, 1972 and 1973 were boom years in new car demand but the effect of earlier replacement of existing cars and, through changes in the second-hand market, of a higher rate of scrappage, was to reduce almost to zero the growth in the number of cars aged two years and over. By contrast, 1975 was the lowest for new car sales since 1970 but there was an abnormally large growth in the number of cars aged two years or more. This compensating variation between OE and replacement demand for passenger cars means that a recession in the motor industry does not necessarily affect all component producers adversely.

G. GOODS VEHICLES

There is a fairly close relationship between tonne-kilometres of freight carried by road and Gross Domestic Product. For 1962 to 1976 there was an income-elasticity of about 1.4 (see note 1) Although this relationship has remained valid over the 15 year period, there have been significant changes in the stock, utilisation and patterns of replacement of goods vehicles.

Table 1.5 shows tonne-kilometres carried by vehicles in different weight categories during the calendar year 1973, 1975 (the first was a year of prosperity, until the last few weeks; the second a year of recession) and compares these data with the results of a Ministry of Transport survey covering the twelve months ended May 1968.

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1 $\text{Log}_e(\text{Tonne-kilometres}) = 1.44(\text{Log}_e\text{GDP}) - 10.95$ $R^2 = 0.95$
(0.09) (0.96) DW = 0.72

or $\Delta \text{Log}_e(\text{Tonne-kilometres}) = 1.35(\Delta\text{Log}_e \text{GDP})$ $R^2 = 0.62$
(0.29) DW = 1.91

TABLE 1.5 ANALYSIS OF FREIGHT TRANSPORT BY ROAD (GREAT BRITAIN)

	Net unladen weight of vehicle (in long tons 1)				
	OVER -	3	5	8	ALL
	NOT OVER 3	5	8	-	VEHICLES
1967-8					
Tonne-km. (10^9)	8.3	28.2	27.0	14.4	77.9
No. of vehicles (10^3)	1116	273	99	34	1522
Tonne-km. per vehicle (10^3)	7.4	103	273	424	51.1
1973					
Tonne-km.	18.9		27.3	44.7	90.9
No. of vehicles	1240	192	143	85	1660
Tonne-km. per vehicle	13.2		191	526	54.8
1975					
Tonne-km.	5.6	9.7	22.5	54.0	91.8
No. of vehicles	1311	162	134	96	1703
Tonne-km. per vehicle	4.3	60	168	562	53.9

Source: Department of Transport (Transport Statistics 1975)

Department of Environment (Highway Statistics 1971 and 1973).

This table reveals a number of changes in the pattern of road transport. The most significant of these is the use of larger vehicles for all but the shortest of journeys. Lorries with unladen weight of over 8 tons accounted for under 19 per cent of freight movement (in tonne-km.) in 1967-8; by 1975 this proportion had increased to nearly 59 per cent. The table reveals lower utilisation of smaller vehicles, which has led to extended lives and to fewer new registrations, except in the smallest category.

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1 One long ton = 1.018 metric tons ("tonnes").

TABLE 1.6 NEW REGISTRATIONS IN GREAT BRITAIN OF GENERAL GOODS VEHICLES 1965-75 (000's).

OVER	1½	3	5	8	Total over 1½ tons	Grand
NOT OVER	3	5	8	-	1½ tons	or less	Total
1965	23.5	35.4	18.4		77.3	144.1	221.4
1966	22.3	35.7	24.1		82.1	138.0	220.1
1967	19.2	28.4	29.2		76.8	137.9	214.7
1968	19.6	28.0	61.8		81.4	143.6	225.0
1969	21.6	30.5	36.3		88.4	145.8	234.2
1970	18.9	25.1	23.7	13.1	80.8	150.8	231.6
1971	18.4	19.4	19.1	12.8	69.7	160.5	230.2
1972	22.2	15.9	18.0	14.0	70.1	192.0	262.1
1973	28.0	14.8	18.3	16.7	77.8	206.0	283.8
1974	24.3	10.6	12.0	16.5	63.4	165.6	229.0
1975	22.5	12.4	12.5	13.8	61.2	150.4	211.6
1976	17.0	14.7	11.9	15.5	59.1	149.3	208.4

Source: Department of Transport and SMMT.

In terms of numbers, smaller vehicles (of 1½ tons or less) now account for over 70 per cent of new registrations. In terms of numbers of batteries this means that they dominate the home-based OE market (some large vehicles have two batteries). For tyres this dominance is less important because larger vehicles have larger tyres and may have six, eight or more wheels.

The historic preference (encouraged by licensing restrictions) for the medium-size goods vehicles in Britain placed U.K. manufacturers at a disadvantage, since the pattern of demand overseas included greater proportions of larger vehicles for long-distance transport and of small vans for local work. Exports of goods vehicles (mostly assembled) amounted to £402 millions in 1976, 12 per cent of all motor industry exports and over seven times the value of imports, which were mainly of car-derived vans.

Total production of goods vehicles is shown in Table 1.7

TABLE 1.7 U.K. PRODUCTION OF GOODS VEHICLES 1965-76 (000's)

	Allocated by manufacturers for			Car-derived vans included in total
	Home Sales	Exports	Total	
1965	271.5	165.7	437.2	123.1
1966	250.4	164.0	414.4	103.1
1967	237.3	129.6	366.9	105.1
1968	250.3	140.3	390.6	97.4
1969	273.0	179.5	442.5	114.8
1970	256.5	177.8	434.3	110.5
1971	255.7	174.0	429.7	113.6
1972	258.6	119.4	378.0	112.4
1973	246.1	140.1	386.2	100.7
1974	220.6	148.3	368.9	92.6
1975	181.3	163.7	345.0	80.5
1976	170.4	168.5	338.9	82.1

Source: Department of Industry (via SMMT)

Goods vehicles generally have shorter lives than passenger cars; the average life is around 7 years compared with about 10½. In the seven years 1970 -6 the new goods vehicle registrations in Great Britain were on average equivalent to 14.8% of the number of goods vehicles in use; for passenger cars, the corresponding proportion was 10.3%. During their shorter lives, goods vehicles cover a greater distance:-

	Average km. per year (000's)			
	1970	1973	1974	1975
Cars	13.8	14.2	13.6	13.8
Goods vehicles	22.8	23.8	22.4	22.1

These figures imply that the average car completes about 150,000 km before scrappage; the average goods vehicle, in its shorter life, about 165,000 km.

For tyres, goods vehicles replacement is one of the most substantial market segments, especially in terms of value. For batteries, of which the life is only partly affected by use, this segment is probably less important. Most goods vehicles (other than the smaller petrol-driven vans and pick-up vehicles) use compression ignition, so that this market is much less important for manufacturers of spark plugs.

H. BUSES AND COACH OPERATORS

Bus and coach operators are also significant users of tyres, because of the high utilisation and long life of public service vehicles. Of the 79,600 buses and coaches[1] in use in Great Britain in 1975, 63 per cent were at least five years old. Average distance travelled was over 43,000 km, more than three times the distance covered by cars. The decline in public transport is reflected in the dwindling proportion of total vehicle-kilometres of road traffic which were accounted for by buses and coaches: 1.47% in 1975 compared with 2.40% in 1965.

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1 Excluding public service vehicles with 8 seats or less. (source: Department of Transport)

FIGURE I : U.K CAR REGISTRATIONS COMPARED WITH ESTIMATES

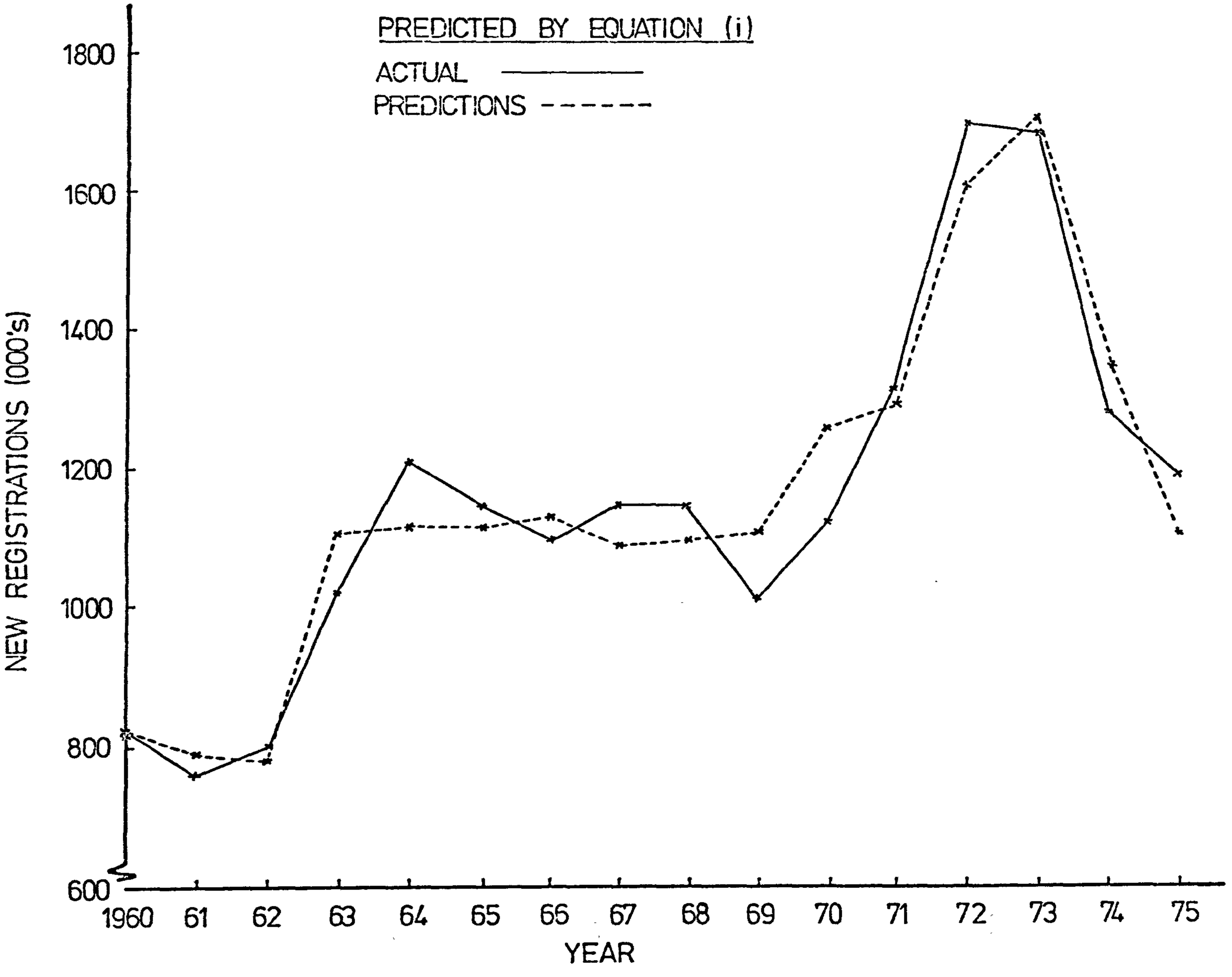
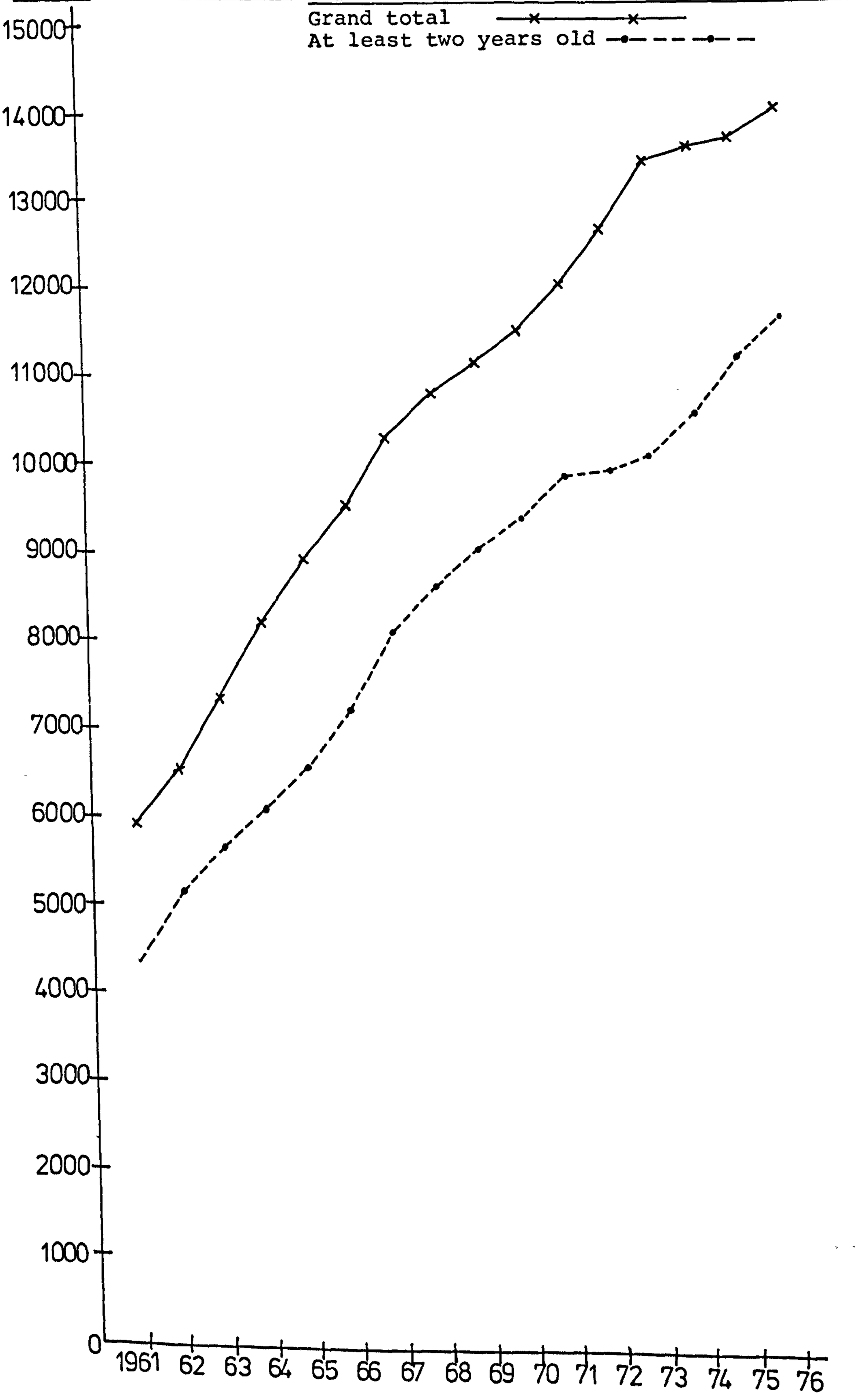


Figure II Passenger Car Stock in Great Britain 1961-76



II. TYRES

A. ANALYSIS OF TOTAL MARKET

Tyre manufacturing is dominated by a small number of large multinational companies. This oligopolistic structure is probably the reason for a high degree of commercial secrecy within the industry. Because of this, there are discrepancies in the estimates of tyre production between data published by the Business Statistics Office and those collected by the British Rubber Manufacturers Association and published by the International Rubber Study Group. These discrepancies are greatest between estimates of production of remoulded tyres.

The B.S.O. figures for the number and value of tyres produced in the United Kingdom in recent years are shown in Tables II.1 and II.2.

TABLE II.1 NUMBERS OF TYRES PRODUCED IN THE UNITED KINGDOM

	Thousands				
NEW TYRES	1968	1972	1973	1974	1975
Car & Van cross-ply	18426	13028	9528	7592	6166
Car & Van radial	6234	14813	17125	16675	17464
Commercial vehicle	3928	3701	3798	3575	3555
New car & CV tyres	28588	31542	30451	27842	27185
RETREADED TYRES					
Car and van	n.a.	7270	6867	5584	5759
Commercial vehicles	800	936	1097	988	1031
Retreaded car & CV Tyres	n.a.	8206	7964	6572	6790
TYRE TUBES					
Car and van	6232	5190	4694	3830	4519
Commercial vehicles	n.a.	2482	2641	2448	2490
Car and CV Tubes	n.a.	7672	7335	6278	7009

Sources: 1968: Census of Production
1972-5: Business Monitor Services.

TABLE II.2 ANALYSIS OF REVENUE FROM SALE OF TYRES (U.K)

(£000's)

	1968	1972	1973	1974	1975
NEW TYRES (COVERS)					
Car & Van cross-ply	57,858	51,038	41,093	41,309	38,608
radial-ply	23,505	72,505	85,638	105,068	138,505
Commercial vehicle	66,040	88,816	97,746	120,512	153,958
Others (mainly tractor earthmover etc.)	25,383	31,351	35,366	44,018	52,342
TOTAL NEW TYRES	202,786	243,710	260,143	310,907	383,414
RETREADED TYRES					
Car & Van	12,619	17,510	15,685	14,980	16,797
Commercial vehicle	8,006	12,658	15,021	17,715	23,000
Other	1,855	3,098	3,332	4,118	4,867
TOTAL RETREADED TYRES	22,480	33,266	34,038	36,813	44,664
Tyre tubes	9,796	9,517	10,031	11,977	16,016
Solid tyres	2,252	1,275	972	1,929	1,245
TOTAL SALES	240,099	287,768	305,184	361,626	445,339
Index of total at constant purchasing power[1]	100	91	89	91	91

Sources: As for Table II.1

The expression of total sales revenue from tyre manufacture in 1975 purchasing power shows that the tyre industry had been static since 1972 and that the real value of sales turnover was 9 per cent lower than in 1968.

Further analysis of Tables II.1 and II.2 requires a breakdown

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1 This is the total sales figure adjusted by the general Index of Retail Prices (for all items of consumption). The result is an estimate of the real income generated by tyre production.

of production in each category into direct exports and domestic demand and of domestic demand into original equipment and replacement sales.

1. U.K. SALES OF TYRES FOR CARS

Data for complete analysis from government sources are available only for 1973 to 1975. These are analysed in table II.3.

TABLE II.3 ANALYSIS OF SALES OF CAR TYRES 1973-5

000's OF TYRES	1973	1974	1975
NEW TYRES: U.K. manufacturers sales	26,653	24,267	23,630
(less) Direct exports	-5,220	-5,423	-5,986
(less) Estimated OE demands	-9,285	-8,181	-6,786
New U.K. tyres for replacement	12,148	10,663	10,858
(add) Imports	+3,754	+4,265	+3,864
Total replacement sales of new tyres	15,902	14,928	14,722
RETREADED TYRES: U.K. manufacturers sales	6,867	5,584	5,759
(less) Exports	- 183	- 268	- 101
(add) Imports	+ 173	+ 297	+ 134
Total U.K. market for retreaded tyres	6,857	5,613	5,792
Total U.K. replacement market	22,759	20,541	20,514
Retreads as % of total	30.1	27.3	28.2

Sources: Business Monitor and Overseas Trade Accounts.

Discussions with vehicle manufacturers revealed that they rarely use imported tyres and it has been assumed in Table II.3 that all imported tyres go to the replacement sector (although it would not affect our estimate of the size of that sector if the imports were added higher in the table). The estimate of OE demand is equal to (five times output of cars and car-derived vans) plus (four times output of three-wheeled vehicles). This may be a slight over-estimate because

the car and van production figures include unassembled vehicles exported overseas; some of these units may not include tyres.

The estimates of replacement demand are close to those produced by other research groups. For years before 1972 it is necessary to rely on sales statistics collected by the British Rubber Manufacturers Association which tend to be lower than official statistics to varying degrees[1]. For this reason and because of less complete breakdown of trade figures, only broad estimates can be given of OE and replacement demand.

TABLE II.4 BROAD ESTIMATES OF ORIGINAL EQUIPMENT AND REPLACEMENT MARKET FOR CAR TYRES 1968-75 (inc. imports) - millions of tyres

		Replacement		
	OE	NEW	REMOULDS	TOTAL
1968	10	14	8	32
1969	9	15	7	31
1970	9	14	7	30
1971	9	15	8	32
1972	10	15	7	32
1973*	9.3	15.9	6.9	32.1
1974*	8.2	14.9	5.6	28.7
1975*	6.8	14.7	5.8	27.3

* Figures for these years are more reliable than earlier estimates (see Table II.3)

The reasons for the variations in OE demand were discussed in Section 1. The static nature of replacement demand has been due to a number of concurrent developments:-

(i) Legislation introduced making it an offence to use tyres without a minimum tread depth of 1cm. This factor would cause earlier replacement.

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1 The BSO was unable, for reasons of commercial security, to discuss reasons for this discrepancy.

(ii) A levelling out of car ownership, especially since 1973. The compulsory testing of older cars, combined with the rising costs of vehicle maintenance and repair, appears to have led to earlier scrappage. In the period 1970-5 the number of cars in use which were at least two years old rose by 1.81 millions,or 19 per cent. In the previous five years the growth had been 2.85 millions, or 43 per cent.

(iii) The progressive adoption of radial-ply instead of cross-ply tyres has reduced the rate of tyre replacement. The average life of a radial tyre is between 40-45,000 km., approximately double that of a cross-ply tyre. The relative importance of radials in the two market segments can be derived from the B.R.M.A. figures:-

TABLE II.5 RADIAL TYRES AS PERCENTAGE OF SALES OF NEW TYRES BY U.K. MANUFACTURERS.

	OE	REPLACEMENT
1971	42	47
1972	58	50
1973	77	52
1974	87	58
1975	91	66
1976	91	72

Source: B.R.M.A. (Rubber Statistical Bulletin of IRSG).

The ex-factory price of a radial tyre is higher than that of a cross-ply tyre but the difference is insufficient to compensate for the longer tyre life:-

TABLE II.6 IMPLIED EX-FACTORY PRICES OF CAR TYRES (£).

	Cross-ply	Radials	Ratio Radials/Cross-ply
1973	4-31	5-00	1-16
1974	5-44	6-30	1-16
1975	6-26	7.93	1.27

Source: Derived from Tables II.1 and II.2.

The increase in the relative price of radial tyres in 1975 probably reflects increasing competition in the market for cross-ply tyres from imported sources.

(iv) A fourth reason for the static nature of replacement sales of tyres, in spite of growing car ownership, is a recent drop in average distance travelled per car, In 1975 this was 13,800 km. compared with 14,300 km. in 1972. This decrease is due partly to increased petrol prices but may also reflect the lower average distances covered by cars in households with two or more cars.

The static nature of the replacement market for car tyres is a major factor in the decline of sales revenue in the tyre industry (measured in constant purchasing power). Whereas in 1968 203 tyres were replaced on every 100 cars in use, by 1975 this number had fallen to 149.

2. THE U.K. COMMERCIAL VEHICLE MARKET

Table II.2 showed the importance to the tyre industry of commercial vehicles. Commercial vehicle tyres (including retreads) accounted for 31 per cent of sales value in 1968 and nearly 40 per cent in 1975, compared with 39 and 44 per cent respectively for car tyres. In numbers of tyres, commercial vehicles accounted for only 13 per cent of sales in 1975. The contrast is explained mainly by the difference in size and specifcation. Marginal costs and, therefore, the basis for bilateral price negotiations are much higher than in the case of car tyres produced in large volumes.

In Section I we indicated that although the average life of a goods vehicle was shorter than that of a passenger car, the total distance travelled before scrappage was, on average, about 10 per cent greater. Table II.7 shows an estimated breakdown of original equipment and replacement demand for commercial vehicle tyres in the period 1968-76:-

TABLE II.7 BREAKDOWN OF COMMERCIAL VEHICLE TYRE MARKET IN U.K. 1968-1975.

	Original Equipment	Replacement New	Remoulds	Total
1968	1,700	1,200	800	3,700
1972	1,022	1,870	936	3,828
1973	885	1,806	1,097	3,788
1974	914	1,726	1,054	3,694
1975	1,156	1,587	1,154	3,897

Sources: Business Statistics Office and
British Rubber Manufacturers Association.

The decline of the OE market for commercial vehicle tyres occurred after 1971. After a boom of four years, U.K. production of goods vehicles (excluding car-derived vans) fell by 16 per cent in between 1971 and 1972. The decline was concentrated in the export markets and, particularly, amoung the medium-size trucks which then were the heavier products of the volume producers of commercial vehicles.

From Table II.7 and the earlier Table II.4 it can be calculated that over the three years 1973-5 original equipment purchases represented 27.6 per cent of total demand for car tyres and 26 per cent of demand for commercial vehicle tyres.

3. DIRECT TRADE

(a) GENERAL

The dominant position of multinational companies, which ship tyres between countries according to current demand and production conditions, makes it difficult to interpret trading patterns. All four of the vehicle manufacturers in the United Kingdom are increasingly organising their activities on the basis of European integration. The tyre manufacturers with U.K. Plants are increasing exports and imports.

TABLE II.8 VALUE OF TRADE IN ALL RUBBER TYRES AND TUBES (£m)

	IMPORTS	EXPORTS
1968	14.6	33.4
1969	13.5	38.8
1970	13.4	52.5
1971	15.0	54.6
1972	25.3	52.5
1973	26.0	68.4
1974	48.3	86.4
1975	56.6	130.7

Source: Overseas Trade Accounts

Most of the growth since 1971 has been associated with intra-European trade. In 1971 Continental Europe received 61 per cent of exports and supplied 89 per cent of imports measured in sterling value. By 1975 the first proportion had risen to 70 per cent, the second remained virtually unchanged. With the rest of the E.E.C. there was a trade surplus in tyre products of £8.4 millions in 1975.

(b) DIRECT IMPORTS AND THE U.K. MARKET-PASSENGER CARS

Discussions with the major vehicle manufacturers revealed that none of these buys tyres from overseas for use on passenger cars and purchases for commercial vehicles are confined to exceptional and specific requirements. Some of the tyres purchased from the major domestic suppliers are imported from those suppliers'overseas plants. Data from B.R.M.A. make it possible to isolate these transfers from competitive imports:-

TABLE II.9 IMPORTS OF NEW CAR TYRES 1971-6

	Total volume (000's)	By BRMA Members	Competitive
1971	2,455	728	1,727
1972	3,501	1,482	2,019
1973	3,754	1,766	1,988
1974	4,265	2,129	2,136
1975	3,864	1,577	2,287

Sources: Customs and Excise. B.R.M.A.

These data show that the main growth in imports in recent years occurred in 1975 although there has been some increase since 1976 in imports from competitive sources. Some imports from Eastern European countries are providing cross-ply tyres at low prices: the withdrawal of some British producers from the cross-ply market has left a gap which these imports can fill. The age-profile of the U.K. car stock remains rather older than those of other European countries, especially France and Germany. Owners of older cars doing moderate distances at relatively low speeds are unlikely to re-equip these vehicles with radial tyres which would outlive them.

Several research inquiries have shown that owners of newer foreign-built cars tend to replace tyres with those supplied by British producers. The fact that these producers are, with only one exception,simply U.K. branches of multinational companies, makes direct importing unlikely on any significant scale.

Even in 1975 competitive imports accounted for only 11.8 per cent of the total purchases of tyres by U.K. car owners; when retreads are excluded this ratio rises to 15.5 per cent.

(c) DIRECT IMPORTS - COMMERCIAL VEHICLE TYRES

Direct imports of tyres for trucks show a very similar pattern:-

TABLE II.10 IMPORTS OF NEW GOODS VEHICLE TYRES 1971-5

	Total Volume	By BRMA members	Competitive
1971	128	24	104
1972	116	47	69
1973	202	93	109
1974	331	82	247
1975	281	32	249

Sources: Customs and Excise. B.R.M.A.

Although the 249,000 tyres imported from competitive sources represented 9.1 per cent of all tyres purchased in replacement market and 15.7 per cent of all new tyres (almost identical to the car position), these tyres tended again to be at the lower end of the market. The average value of an imported tyre was £33.20 compared with the average value of exported tyres of £40.45.

(d) DIRECT EXPORTS

A breakdown of tyre exports into those for cars and those for commercial vehicles is available in official statistics only for 1969 onwards.

TABLE II.11 EXPORTS OF NEW CAR AND COMMERCIAL VEHICLE TYRES 1969-75.

	Numbers (000's)		Value (£000)	
	Car	Commercial	Car	Commercial
1969	3,511	704	13,663	12,914
1970	5,997	794	23,777	14,281
1971	5,776	1,095	24,741	21,817
1972	4,456	925	20,031	19,220
1973	5,220	1,233	25,600	25,043
1974	5,423	1,004	34,154	26,343
1975	5,986	1,315	42,259	53,196

Source: Overseas Trade Statistics (Customs & Excise).

The large increase in the value of commercial vehicle tyre exports in 1975 reflects the 31 per cent increase in volume, the effect of price inflation and (one must conclude) a high proportion among the additional exports of larger, more expensive tyres, Sweden was the largest single national export market in 1975. It took 20 per cent of all commercial vehicle tyres exported from the United Kingdom and accounted for nearly 24 per cent of export value. Many of these were probably used as original equipment on new trucks assembled in Sweden. 16 per cent of all commercial vehicles imported

into the United Kingdom in 1975 were Swedish-assembled but, because these were mainly large trucks, their value was over 40 per cent of that of all commercial vehicles imported.

Other large markets for commercial vehicle tyres (value exceeding £3 millions in 1975) are West Germany, Finland, the United States and Australia. European countries accounted for 73 per cent of the value of commercial vehicle tyres exported.

European countries also took the majority of car tyres exported from the United Kingdom - 75 per cent by volume and 84 per cent by value. Western Germany was the largest single market (possibly representing shipments by one of the multinational vehicle manufacturers) followed by Sweden, Australia, Turkey, Finland and Belgium. All of these are countries to which British vehicle parts are sent for final assembly by locally based companies, by subsidiaries of British Leyland or by subsidiaries of the three American vehicle manufacturers with plants in the United Kingdom.

In addition to car and commercial vehicle tyre casings, other tyre industry exports include tyres for tractors, earthmovers and construction vehicles (12.6 millions in 1975); tyres for aircraft and motor and pedal cycles (1.5 millions in total); innertubes (£5.0 millions in 1975), tyre flaps and solid tyres. Exports of these last items and of retreaded tyres were relatively insignificant.

B. THE STRUCTURE OF THE INDUSTRY

1. NUMBERS OF COMPANIES MANUFACTURING EACH PRODUCT WITHIN THE U.K.

The Business Statistics Office shows the number of separate enterprises producing each category as follows:-

TABLE II.12 NUMBERS OF FIRMS REPORTING TO B.S.O.

	1968	1973	1975
New car tyres: cross-ply	7	6	5
radials	7	6	6
New tyres for goods vehicles	7	6	6
Retreaded tyres: cars	16	18	20
goods vehicles	16	17	19
Inner tubes	7	6	7
Solid rubber tyres	15	8	7

As Table II.12 shows, there were only seven enterprises engaged in new tyre production in the U.K. (although the number of trading companies appeared to be higher because some enterprises had subsidiaries trading under separate names). These companies were:-

Avon Rubber Co. Ltd.,
Dunlop Holdings Ltd.,
Firestone Tyre and Rubber Ltd. (Subsidiary of U.S. Parent),
Goodyear Tyre and Rubber Company Ltd. " " " "
Michelin Tyre Company Ltd. (Subsidiary of French Parent),
Pirelli Ltd. (Subsidiary of Italian Parent)
Uniroyal Ltd. (Subsidiary of U.S. Parent).

As from the 1st January, 1971 Dunlop Holdings Ltd. merged most of its activities (including its principal tyre-making subsidiary, Dunlop Ltd.) in a union with Industrie Pirelli SpA. The union has a complex structure and for many trading purposes the Dunlop and Pirelli activities are separate - for example each has its own production and distribution facilities. From a financial standpoint, however, Dunlop Holdings Ltd. has a 51 per cent interest in the English company Pirelli Ltd. and a 49 per cent interest in Pirelli's other EEC activities. The Pirelli parent has a 49 per cent interest in Dunlop Ltd., and Pirelli Ltd. and a 51 per cent interest in its own activities elsewhere in the EEC. The arrangements for control of subsidiaries outside the European Economic Community are more complex.

The formation of the Dunlop-Pirelli Union in 1971 explains the decrease in the number of companies manufacturing new tyres, from seven to six. The official figures showed only five companies making cross-ply tyres in 1975 because of the withdrawal of Uniroyal from the production of cross-ply tyres. Some of the other multinational companies may also be curtailing U.K. production of cross-ply tyres and, while they still sell these, supplies are sometimes obtained from outside sources.

2. RETREADING (and remoulding)[1]

The retreading process does not require the use of large, indivisible items of capital equipment. Worn tyres are acquired from garages and distributors at low prices; the old tread is removed and the casing is scored for the subsequent addition of uncured rubber. The casing is then placed in a mould and the tread is applied under heat conditions.

The major tyre producers all sell retreaded tyres, though some of this work is sub-contracted to independents. Although the Business Statistics Office reported that 20 companies produced retreads in 1975 this does not include firms with no establishment employing 25 or more persons. The Retread Manufacturers Association has 25 members (these do not include the new tyre producers) and there are possibly as many as 50 other small companies engaged in retreading.

Retreaded tyres accounted for 30 per cent of replacement demand for car tyres in 1973; 27 per cent in 1974 and 28 per cent in 1975. For the commercial vehicle replacement market the proportions were rather higher:- 38 per cent in 1973 and 1974, and 42 per cent in 1975. The retreading of commercial vehicle tyres is more profitable than that of car tyres, because the principal element of cost in retreading is labour, which is little affected by the size of tyre.

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1 Retreading and remoulding are normally undertaken at different stages of one process. Retreading is the more common technical description but "remoulds" is the term more generally used. The terms are used interchangeably in this report.

About 35 per cent of all retreaded tyres are sold by the major producers of new tyres, partly under their own brand names and partly as "second-line" remoulds. The independent retreaders have to overcome a number of competitive disadvantages:-

(a) With increasing publicity devoted to road safety and the higher vehicle speeds, especially on motorways and dual carriageways, of which there were 3,864 kilometres in Great Britain in 1970 and 6,185 km in 1975, there is consumer resistance to retreaded tyres. The issue of a British Standard specification (Au144) followed pressure by the Retread Manufacturers Association who were eager to improve the image of the product. An official representative of the R.M.A. expressed concern about the failure of the smaller non-member firms to comply with the standard, with resulting adverse publicity.

(b) The ownership by the main tyre manufacturers of many of the retail outlets, described in the next section, makes it difficult for independent retreaders to sell their own products (as opposed to sub-contract work). Some retreading companies have established their own outlets but, because these need to stock a wide product range, the economics of this forward integration are uncertain.

(c) Independent distributors are more likely to recommend new tyres to customers in doubt about remoulds, partly because of higher retail margins but also because of the publicity of major tyre companies who advise more restricted use of remoulds than that specified in the British Standard.

(d) The major tyre companies' own branded retreaded tyres are likely to be more acceptable than lesser known brands. They can also offer "second-line" remoulds in order to appeal to the price-conscious segment of the market. Such "second-line" products may be advertised by company-owned distributors at very low prices; the objective would then be to attract the motorist to the distributive outlet where he might be persuaded to purchase new tyres or branded remoulds.

For all these reasons, there is great downward pressure on the price of remoulds produced by independents. Their retail price is normally around 40 per cent of that of a new "first-line" tyre of the same dimension. The prospects for retreaded tyres are uncertain, expecially with the move to radial tyres. The remoulded radial tyre has not yet proved popular and the fact that a new radial tyre imposes much lower cost per kilometre travelled than the cross-ply tyre (see Table II.6) reduces the economic pressure for the purchase of remoulds. More stringent vehicle testing may lead to the scrappage of many of the older vehicles used for short distances at modest speeds, for which remoulds are most often purchased.

3. DISTRIBUTION OF TYRES TO THE REPLACEMENT MARKET

A survey of sales of passenger car tyres by type of outlet showed the following pattern in 1975:-

TABLE II.13 REPLACEMENT TYRE PURCHASES BY TYPE OF OUTLET, 1975

	%
Manufacturer owned outlets	35
Independent dealers	30
Garages, filling stations etc.	29
Other (chain stores, mail order etc.)	6

Source: E.I.U. (Ref 1)

The retail distributors of the manufacturers are as follows:-

	Estd. No. of outlets
Dunlop: National Tyre Service	450
Pirelli: Central Tyre Company	100
Goodyear: Tyre Services Holdings Ltd Kettering Motor Service Group Ltd. (and other smaller subsidiaries)	400
Firestone: Tyre and Auto Services Ltd. Ect.	240
Michelin: Associated Tyre Specialists Ltd.	360
Avon: Motorway Tyres and Accessories Ltd.	180

Sources: Company accounts, EIU and author's estimates.

One of the major manufacturing companies, Uniroyal, sold its outlets to Associated Tyre Specialists Ltd. (the Michelin subsidiary) in 1974, a decision which was linked to the withdrawal from cross-ply tyre production.

Outside the subsidiaries of the major tyre producers, there are few large distributors of tyres. Only one company, Kennings Ltd. a distributor of Leyland Cars, has a national network of tyre depots. Many of the independent dealers have fewer then ten outlets.

One major independent distributor is Esso Ltd., which acts as a factor for car components and accessories. Until about 1974, Esso obtained its tyres from Uniroyal Ltd. and, when that company withdrew from cross-ply production, Firestone and Goodyear became the main suppliers.

Partly because the customer is mobile, there is fairly intensive competition in tyre distribution. This has led, since the abandonment of resale price maintenance in the mid 1960's, to price-cutting and competitive advertising by retailers. It has also induced some of the manufacturer-owned distribution companies to reduce the number of outlets in order to minimise overheads and to remain competitive.

One of the interesting features revealed by a survey of Bedfordshire outlets is that the manufacturer-owned distributors do not emphasise their ties with that manufacturer's brands. Indeed most such outlets also stock the products of other manufacturers and, whilst the customer is invited to purchase tyres made by the parent company, competitive brands (including tyres at substantial discount) are occasionally advertised .

4. THE NATURE OF COMPETITION IN THE REPLACEMENT MARKET

The EIU reported that 73 per cent of all tyres sold in the United Kingdom were within six size-categories and that about 25 per cent were of one size. A number of research studies has shown that there is little brand loyalty among customers for replacement tyres. There is intensive competition among a small number of

manufacturers of a fairly standard product with static demand. There are three main product lines:- remoulded tyres, cross-ply tyres and radial tyres, with a further development in steel rather than textile-based radial tyres. Competition takes a number of forms:-

(a) Quality

We have already pointed out[1] that one of the reasons for the static replacement market for tyres is the greater use of radial tyres, which give the motorist approximately double the tyre-life of cross-ply tyres for an increase of about 30 per cent on price. Improvements in quality have occurred through competitive pressure and longer life has been advertised as an attribute of individual brands.

It is interesting to note the speech by the managing director of Dunlop Holdings Ltd. to the 1977 convention of the National Tyre Distributors Association[2], in which he suggested that research into production of tyres with increasingly long life should be curtailed. Car manufacturers and motorists were, in his view, satisfied with radial tyres lasting 57,000 to 65,000 kilometres. "Expense to make the tyre last longer is neither economic sense nor a customer requirement."

The need for and obstacles to agreement on product life among oligopoly producers of a semi-durable product are well documented.

(b) Advertising

Estimates of total expenditure on advertising by tyre producers are collected and published by Media Expenditure Analysis Ltd (MEAL). Data for each of the years 1972 to 1976 are shown in Table II.14:-

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1 On page 21 above.

2 Summarised, with longer quotations in SMMT: Motor Industry News Digest, June 1977.

TABLE II.14 EXPENDITURE ON ADVERTISING OF TYRES 1972-6 (Press & TV)

(£000's)

	1972	1973	1974	1975	1976
Avon Tyres	4	42	NIL	33	14
Motorway Tyres	24	55	31	29	12
Dunlop Tyres[1]	624	527	356	889	965
National Tyre Service	79	68	69	152	167
Firestone Tyres	287	319	432	229	333
Albany Tyre Service	44	25	9	10	11
Goodyear Tyres	431	435	410	415	720
Tyre Service (Great Britain)	23	41	86	49	88
Michelin Tyres	372	532	364	458	474
Associated Tyre Specialists	78	134	72	89	120
Pirelli Tyres	104	154	121	53	256
Uniroyal	240	317	6	22	10
All others	445	388	247	174	275
TOTAL TYRE ADVERTISING	2,755	3,037	2,203	2,602	3,445

Source: MEAL digests.

Over the years since 1969 the value of advertising expenditure had tended to fall in real terms:-

TABLE II.15 ADVERTISING EXPENDITURE 1969-76.

	Advertising Expenditure (£000's)		
	Current Prices	Index at Constant Purchasing Power	No. of replacement car tyres sold (est. in millions)
1969	2,914	100	14
1970	2,158	70	15
1971	2,737	81	14
1972	2,755	76	15.1
1973	3,037	77	15.9
1974	2,203	48	14.9
1975	2,602	46	14.7
1976	3,445	53	15.7(prov)

1 Including subsidiary companies other than the Pirelli group.

Most of the advertising relates to new car tyres for replacement and in 1973 this was equivalent to about 20 pence per tyre sold, or about 3 to 4 per cent of the wholesale price.

There is some evidence in Table II.15 to suggest that advertising has a positive income-elasticity:- in the depression years of 1974 and 1975 advertising expenditure on tyres fell, by over 37 per cent in inflation-adjusted terms.

Table II.14 also shows how the largest enterprises dominated advertising. Including its distributive outlets, the share of each firm in the total was as shown in Table II.16. Some of the brands shown in "others" were produced by the large companies (for example Kelly-Springfield tyres are produced by Goodyear and Esso tyres were produced by Uniroyal until 1974 after which supplies were obtained from Firestone and Goodyear).

TABLE II.16 SHARES OF TOTAL ADVERTISING 1972-6

	1972	1973	1974	1975	1976
Dunlop-Pirelli	29.3	24.7	24.8	42.0	40.3
Firestone	12.0	11.3	20.0	9.2	10.0
Goodyear	16.5	15.6	22.5	17.8	23.5
Michelin	16.3	21.9	19.8	21.0	17.2
Uniroyal	8.7	10.4	0.3	0.8	0.3
Avon	0.9	3.2	1.4	2.4	0.8
Total of above	83.7	87.1	88.3	93.2	92.1
Others	16.3	12.9	11.7	6.8	7.9
	100	100	100	100	100

(c) Brand Names in the Distributive Market

Multiple brands are a feature of competition within an oligopolistic group and their existence may act as a barrier to outside firms. "Second-line" new tyres represent an attempt by manufacturers to segment the market into the price-inelastic segment which remains loyal to well-advertised brand-names and the more

price-conscious segment. Because tyres are a "concern" product (a burst tyre may mean death), loyalty to established brands is probably high but research surveys show that there is little loyalty to a single brand. The effect of advertising and "concern" is, more probably, to create preference for any one of the well-recognised brands. This would explain marked differences between retail prices of first and second-line brands.

Some examples of second-line brands are listed here:- Each of the major companies also sells tyres under its own name.

Dunlop:	India, India Remoulds, John Bull, Regent Remoulds (Dunlop Remoulds are also sold).
Firestone:	Dayton.
Goodyear:	Lee, Kelly-Springfield.
Avon:	Henley.
Michelin:	Bergougnan.
Uniroyal:	Esso (until 1974), now radial tyres under distributors' labels.

(d) Price Competition in Replacement Market.

Previous research surveys have revealed relatively little about price competition in the tyre industry. Before 1965 there were price agreements among major manufacturers which were facilitated by resale price maintenance. With the abandonment of resale price maintenance and the diversity of channels of distribution, price and quota-fixing agreements would be difficult to sustain. Retail prices for identical brands vary by as much as 30-40 per cent between outlets and, while the margin for brokers and retailers combined might represent about 40 per cent of the full retail price, it is difficult to believe that manufacturers are not also offering discounts to brokers.

There is some need for further research into price structure but this requires empirical work on a scale beyond the current investigation.

5. MARKET SHARES IN THE REPLACEMENT SEGMENT

Most of the market surveys conducted commercially have been concerned with the car replacement - a survey of commercial vehicle market shares would be more difficult. One of the difficulties in interpretation of survey findings is the assignment of second-line brands to residual categories. In our own estimates we have tried to combine data from two surveys:-

TABLE II.17. ESTIMATES OF MARKET SHARE (new tyres, car replacement)

	1972	1975	1976
Dunlop Pirelli	28	28	26
Goodyear	25	19	23
Michelin	14	19	20
Firestone	12	10	11
Uniroyal	8	7	3
Avon	5	5	4
Others (mainly imports)	8	12	13
	100	100	100

Notes

(i) The table understates the Uniroyal market share in 1976 because the ending of the Esso contract was followed by supply to other distributors.

(ii) It is important to emphasise that all brands are included in the estimates for each manufacturer. Although Michelin is regarded in some quarters (e.g. by EIU) as market leader, when the Dunlop and Pirelli figures are merged and "second-line" brands included this is no longer the case.

6. THE ORIGINAL EQUIPMENT MARKET

Discussions with the major vehicle manufacturers and the trade association of the tyre manufacturers revealed the following feautures :

(a) All vehicle manufacturers keep very low inventories of tyres with a maximum of about three days' production requirements, except when supply difficulties are envisaged (for a specific size or type of tyre). Tyres are delivered daily from local depots of the tyre companies; schedules of expected requirements are issued by the vehicle manufacturers for a few months ahead but these do not represent a commitment to the tyre producer and are revised continually. This means that the vehicle manufacturer transfers to the tyre manufacturer the costs associated with variations in production, which result not only from variations in demand for particular vehicles but also from interruptions in supplies of other components or in facility for delivery.

(b) Dunlop Ltd. may have a slight advantage over its tyre-producing competitors through its near-monopoly of wheel production for volume cars, other than those of Ford. (Ford has its own wheel-producing subsidiary.) Dunlop fits tyres supplied by competitors, as ordered by the vehicle manufacturers purchasing the wheels. Wheels for some Leyland Cars (mainly outside the former Austin-Morris division) are made by Rubery Owen Ltd. and wheels for commercial vehicles are made by Guest Keen and Nettlefold Ltd. Although none of those interviewed had perceived any competitive advantage for Dunlop, it is difficult to believe that this could not exist under conditions of high demand for wheels.

(c) Dual sourcing of tyres is now the norm for all the vehicle manufacturers. Until 1970 Dunlop was the sole supplier to the Austin-Morris division of British Leyland and it remains the dominant supplier but like the other manufacturers, Leyland buys each size of tyre from at least two sources. All three of the vehicle manufacturers interviewed consult all six of the main tyre producers at least once a year and negotiate prices and volumes. In practice, some trading patterns tend to be fairly constant.

British Leyland obtains 87 per cent of its tyres from

three suppliers and Dunlop remains the largest supplier.

Ford and Vauxhall probably obtain most of their requirements from Firestone, Goodyear and Uniroyal. Vauxhall normally uses only two suppliers for any one tyre size.

Chrysler buys from all six main suppliers.

(d) Although tyre prices are bilaterally negotiated, tyre producers tend to ask for price increases of similar proportions at round about the same time of each year. Under the current U.K. system of price control, the Price Commission gives permission to each manufacturer for an average price increase. This means that some common adjustment of prices is possible. There is no evidence of price collusion, either overt or tacit, but the price-leadership which Dunlop has occupied in the replacement sector may also occur, at least intermittently, in the OE sector. On standard, high volume, tyres price-differences between suppliers are generally less than one per cent.

Estimated Shares of the OE Market (by volume) 1975

These estimates are based on those of the EIU (Ref 1) and the results of our own discussions:-

	Per cent of all tyres (car and C.V.)
Dunlop	27
Goodyear	25
Firestone	24
Michelin	11
Uniroyal	8
Avon	5

7. RELATIVE PROFITABILITY OF OE AND REPLACEMENT MARKET

We have secured some statistics on which it is possible to base estimates of average price of tyres sold to the OE and replacement markets in each of the years 1972 to 1976.

The prices are those of manufacturers and do not include taxes or margins paid to distributors. Calculations suggest that for a new radial tyre the average price received by manufacturers on sales to the replacement market in 1975 was about £9.50 and on sales to the OE sector about £6.50. Where the manufacturer controls the distributive outlet additional income will, of course, be earned.

C. FINANCIAL ANALYSIS AND CONCENTRATION TABLES

In the analysis of concentration, based on the methodology prescribed by the Commission of the European Communities, it has been necessary to consider (1) the sharp dividing line between the large companies manufacturing new tyres as well as remoulds and the much greater number of small enterprises engaged in retreading and (2) the multi-national nature of the large tyre manufacturers.

Because of (1) we have confined the Tables of Concentration to the large firms and refer to the smaller retreading companies only in the written text. Because of (2) we have omitted certain variables which have clearly been distorted by differing accounting policies of the multi-national groups in their treatment of United Kingdom activities. The variables used and activities covered are at three levels:-

(1) All Activities in the United Kingdom: for each of the six groups (Avon, Dunlop-Pirelli, Firestone, Goodyear, Michelin and Uniroyal) tyres are believed to be the majo. U.K. product but a detailed breakdown of turnover is not available in every case. For this reason, U.K. activities include the tyre companies' other products manufactured in this country.

01 Sales Turnover - no difficulties here: data are taken straight from company accounts.

02 Employment - data are from company accounts. There are problems of interpretation because where the company's head office is in the U.K. (Avon and Dunlop), the ratio of employees to U.K. sales is higher than in the U.K. subsidiaries of foreign - based companies. This is because of administrative staff with world-wide responsibilities, who in turn require more supporting staff.

03 Wages-Bill - similar comments apply.

04 Net Profits before tax - although this variable is used in the analysis, there are some doubts about the reliability of figures for subsidiary companies (e.g. the U.K. branches of multi-nationals). Differences between methods of allocation of parent company overheads and of accounting for depreciation may distort comparisons. Profit figures generally have overstated financial performance in recent years because of rapid inflation. The use of historic cost accounting means that depreciation is understated and time-lags between payments and receipts are not allowed for. Not all companies are equally affected especially in an industry where the timing of rubber purchases is important.

11 Advertising Expenditure - this is included as an additional variable because data were available, and advertising is an important aspect of competition in this industry. The data are based on MEAL surveys (see above p. 33) but there are some important limitations. For example, when a manufacturer sells much of his output under the brand-name of a distributor, it is possible that he may contribute to the advertising costs. No allowance has been made for this.

Variable 08 (Exports) is excluded from the analysis because for multi-national companies this concept has little meaning.

Variables 05 (cash flow), 06 (capital expenditure), 07 (equity capital), 09 (net cash flow) and 10 (net assets) are excluded because neither Dunlop nor Avon publishes separate figures for these variables for the United Kingdom.

(2) Tyres World-Wide

Five of the six companies published a breakdown of world-wide turnover and profits by product groups for each of the years 1969-75. These figures are used in the analysis.

(3) All Activities World-Wide

The Michelin group published consolidated accounts for the first time during the survey period for the year 1975. Complete Tables of Concentration have been prepared only for that year. These relate to the following variables:-

01 Sales Turnover
04 Net profits before tax
05 Gross cash flow (=04 plus depreciation)
06 Gross capital expenditure
07 Equity (own capital)
09 Net cash flow (05 - tax)
10 Net assets (equity plus long-term borrowing)

1. COMMENTS ON TABLES OF CONCENTRATION

TABLE 1. relates to U.K. activities and shows the evolution of total industry of each of the five variables. Because of rapid inflation over the six-year period (94 per cent increase in retail prices) we have also prepared Table 1(a) which shows all the totals in terms of 1975 purchasing power. (Industry sales, so adjusted, are not expressed in volume terms but in terms of a constant monetary unit.)

Over the six years sales turnover of the sample of companies rose in constant purchasing power (c.p.p.) terms by 14 per cent.

The largest increase occurred in 1974 and reflects a large relative increase in the average price of tyres, which in turn was due to a sharp increase in the price of rubber (the sterling price doubled between the first quarter of 1973 and the first quarter of 1974). The subsequent fall in the price of rubber benefited the tyre producers and led to a substantial improvement in profits (51 per cent in money terms, 31 per cent in c.p.p. terms). This appears to demonstrate the effectiveness of an outside lever on prices within an oligopoly - a kind of "ratchet" effect. As will be shown later, the recovery in profits was not experienced by all companies.

The sharp drop in advertising expenditure (46 per cent in c.p.p. terms) is typical of many industries over the past few years. Advertising expenditure has been fairly volatile in this industry and no stable pattern, usually expected in oligopolistic industries, has emerged.

TABLE 2. shows the values of certain summary indices of concentration for each variable in each of the seven years. Variables 02 and 03 (employment and wages-bill) were generally more concentrated than sales turnover but this was due to the inclusion in the case of Dunlop, the largestsingle firm, of all employees in the U.K., including those with responsibility for overseas activities. In 1971, after the merger with Pirelli, Dunlop's sales turnover was 48 per cent of that of the six firms combined while it accounted for about 56 per cent of employment; in 1975 the figures were 44 and 53 per cent.

Except in 1970 and 1971, profits were consistently more concentrated than sales turnover. This evidence needs to be treated with some care because the profits figures for U.K. activities are affected by decisions on the allocation of joint costs etc. which are in turn influenced by considerations of comparative taxation.

The concentration indices all show little change in the degree of concentration of sales turnover over the seven years, though the merger of Pirelli's tyre interest with Dunlop in 1971 is reflected

by a discrete change in all three indices in that year.

TABLE 3. shows concentration ratios (C_2 and C_4) together with Linda indices (L_2 , L_4 , Ln*h and Ln*m). Definitions of these indices and a guide to their interpretation has been provided by Linda (in Ref. 3). These are summarised in Appendix A.

For sales turnover the concentration ratios increased in 1971 with the Dunlop-Pirelli merger and also showed an increase in 1975. The Linda index suggest that in 1974 and 1975 the three largest enterprises formed a distinct oligopolistic group within the sample of six firms.

These three (Dunlop, Michelin, and Goodyear) achieved 82 per cent of total turnover in 1975: Goodyear's share was 14.6 per cent, while the next largest company (Avon) held less than seven per cent.

Net profits appear more concentrated than turnover in each year but, because of differences in rankings, this needs to be interpreted carefully (even C_4 does not refer to the same four firms for turnover and net profits in 1969, 1970, 1974 or 1975). Since net profit is a residual and a more volatile variable than turnover, greater concentration in any one year must be expected.

The minimum values of Linda index show that in every year except 1975, there was a smaller grouping within the oligopoly which comprised firms making greater profits. Dunlop and Michelin were members of this group throughout: In 1975 the absence of a minimum value of the Linda index (a continuously rising Linda curve) occurred because these two firms achieved profits much greater than those of any competitors - Dunlop obtained 39 per cent and Michelin 54 per cent of all profits earned within the industry.

Advertising expenditure by each firm was also highly variable. Although it appears to be highly concentrated with a smaller group of heavy advertisers within the oligopoly, the composition of this group changed from one year to the next.

Because of the distortion caused by inclusion of British based companies along with U.K. subsidiaries of foreign companies, interpretation of the concentration ratios and Linda coefficients for employment and wages bill is difficult.

TABLE 4. is a summary of the Linda indices for this sample. The coefficient LS (known as an Index of Synthesis) summarises the degree of inequality within the oligopoly group of n*m firms. Two main features emerge from this table:-

(i) For employment and wages bill the values of LS are consistently higher than those for turnover (01) and profits (04). This is because of the distortion already described.

(ii) For sales turnover the value of LS is greater than for profits except in 1974. (In 1975 the minimum of the Linda curve for profits was at its first point, so that LS = Ln*m = Ln*h = 0.702, but this value is not shown because it does not satisfy Lindà's own definition of n*m.)[1] The principal reasons for the lower values of LS when applied to profits is that the largest firm (Dunlop) reported a lower profit margin on U.K. sales than the group average in every year except 1974 (see Table 5).

TABLE 5. shows profitability ratios. Because of the doubt surrounding the comparability of the U.K. profits figures the ratios have been calculated for world-wide activities also. Some of the results call for comment:

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1 See R. Linda: Methodology of Concentration Analysis applied to the Study of Industries and Markets, p.19)

Comparison of the ranking of companies by U.K. and world-wide profit margins (net profits over sales) illustrates some of the difficulties in interpretation of subsidiary figures. Rankings are compared in Table II.19 below:-

TABLE II.19. RANKING OF FIRMS BY PROFIT MARGINS (R1)

	1969	1970	1971	1972	1973	1974	1975
No. of firms for which margin calculated	5	5	5	5	5	5	6
Avon: U.K.	4	3	3	1	1	4	6
World-wide	5	4	4	4	4	5	6
Dunlop: U.K.	3	5	5	2	2	2	3
World-wide	3	3	3	3	3	3	3
Firestone: U.K.	2	2	2	4	5	5	5
World-wide	2	2	1	1	1	1	1
Goodyear: U.K.	1	1	1	3	3	3	4
World-wide	1	1	2	2	2	2	2
Michelin: U.K.	-	-	-	-	-	-	1
World-wide	-	-	-	-	-	-	4
Uniroyal: U.K.	5	4	4	5	4	1	2
World-wide	4	5	5	5	5	4	5

NB Michelin has been excluded from this table until 1975 because consolidated accounts for the Michelin group were first produced in that year. The company's U.K. profit margin was better in each year until 1973 than any other firm in the sample.

R2, R3, R4 Table 5 also shows net profits before tax in relation to equity and gross cash flow (net profits before tax plus depreciation) in relation to sales and equity again for all activities world-wide.

On page 3 of Table 5 we have shown two additional ratios, net cash flow (profits after tax plus depreciation) as a percentage of sales (R5) and of equity (R6). In the author's own view, it is

with net cash flow that the multi-national company is most likely to be concerned in relating financial strategy to taxation conditions in different countries. Net cash flow as a proportion of equity shows how the enterprise is using shareholders' investment to generate additional funds. Table II.20 shows how the ranking of the six companies varied according to the six alternative ratios (applied to world-wide activities) in 1975:-

TABLE II.20. RANKING OF SIX COMPANIES ACCORDING TO FINANCIAL PERFORMANCE WORLD-WIDE IN 1975.

	R1	R2	R3	R4	R5	R6
Avon	6	6	6	6	6	6
Dunlop	3	4	4	4	4	4
Firestone	1	3	2	3	2	3
Goodyear	2	1	3	2	3	2
Michelin	4	2	1	1	1	1
Uniroyal	5	5	5	5	5	5

$R1 = \frac{\text{Net profits before tax}}{\text{Sales turnover}}$ $R2 = \frac{\text{Net profits before tax}}{\text{Equity}}$

$R3 = \frac{\text{Gross cash flow}}{\text{Sales turnover}}$ $R4 = \frac{\text{Gross cash flow}}{\text{Equity}}$

$R5 = \frac{\text{Net cash flow}}{\text{Sales turnover}}$ $R6 = \frac{\text{Net cash flow}}{\text{Equity}}$

TABLE II.20. shows that in 1975 the two U.K. based firms were ranked fourth (on five out of six criteria) and sixth in financial performance. However, a closer look at the previous years shown in the six parts of Table 5 shows that the pattern has not been consistent over the seven years.

TABLE 6. is a recent addition to the Tables of Concentration as presented by the Commission. It shows the absolute changes between successive years in each company's share of the total value of each of variable x for company i then :

$S_i = x_i/\Sigma x_i$ where s_i is the share of company i

and $d_i = (S_i)_{t+1} - (S_i)_t$ where t indicates year.

The index of dynamism (d) = $\frac{100\ \Sigma\ di}{2}$

Advertising expenditure was excluded from Table 6 because its volatility might partly be explained by variations in arrangements between certain manufacturers and distributors who sold tyres under their own brand names (e.g. ESSO was a heavy advertiser and until recently sold Uniroyal tyres, Kennings sell a large number of John Bull tyres made for them by Dunlop).

As might be expected with a residual figure, the shares of net profits were much less stable than those of the other variables (sales turnover, exployment and wages bill). The mean of indicies of dynamism for each variable over the six companies were:-

01 Sales turnover	1.98
02 Employment	1.88
03 Wages bill	2.25
04 Net profits before tax	25.98

No single major factor appears to explain the changes in the degree of stability within the industry. The increased "dynamism" at the end of the survey period appears to reflect more aggressive advertising by Michelin. While advertising by Avon and Uniroyal was negligible in 1975, that of Firestone and its distributive subsidiaries was over 40 per cent down on 1974 in £ terms and that of Goodyear was down by about 7 per cent. Meanwhile Michelin increased advertising by about 23 per cent. Later in 1975, Dunlop launched a heavy advertising campaign so that in the year as a whole its expenditure was more than double that of 1974 (see Table II.14). The Dunlop marketing drive continued until 1976 but information on its effects is not available.

TABLE 6(a) shows the percentage shares on which Table 6 is based. It is summarised in Table II.21, which compares "market shares" in 1969 and 1975.

TABLE II.21. SHARES OF COMBINED U.K. TURNOVER 1969 and 1975.

	(Percentages) 1969	1975	Change
Avon	8.16	6.95	-1.21
Dunlop/Pirelli	48.03	43.51	-4.52
Firestone	7.36	6.06	-1.30
Goodyear	15.69	14.58	-1.11
Michelin	15.52	24.18	+8.66
Uniroyal	5.24	4.72	-0.52

The increase in the market share of Michelin at the expense of all the other companies was a continuing process. Michelin's share of combined U.K. turnover increased every year during the survey period.

Michelin's strength in the U.K. market is even greater than these figures suggest:-

(i) The company is much less strongly represented in the less profitable OE sector than in the replacement market.

(ii) The Michelin figures do not include the sales of Kléber or Semperit tyres imported into the United Kingdom from France and Austria respectively. These two brands accounted for about 5 per cent of the U.K. replacement market in 1975. The Michelin parent company has a 30.9 per cent participation in the Swiss holding company which controls the Semperit and Kléber Colombes subsidiaires.[1]

TABLE 7. shows the main indices prescribed by the Commission applied to six variables for all activities world-wide in 1975. One clear feature is that the smallest company does not form part of the world-wide oligopoly - Avon is primarily a United Kingdom company. Another feature is that variable 04 (net profits before tax) is

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1 Report of C.G.E. Michelin 1975, page 52 (published only in French)

more concentrated than other variables. The value of LS shows greater inequality of profits than of any other variable. Net cash flow is, in our view, a more comparable measure of financial performance. This also was more concentrated than sales turnover and, in most respects, than the two capital stock variables (equity and net assets).

TABLE 8 shows the basic data used in the calculation reported in Table 7.

At the end of the Tables of Concentration are presented two of the Commissions three matrices of oligopolistic interdependence (Matrix 1 and Matrix 3) for United Kingdom and two more matrices (Matrix 1 and Matrix 2) for the world-wide activities.

For U.K. activities, Matrix 1 shows that the degree of inequality among firms was greatest in 1970 with respect to advertising expenditure and least with respect to profits. Because variables 02 and 03 (employment and wages bill) are distorted by the inclusion of both U.K. and overseas-based companies, the comparative ranking of net profits (04) and sales turnover (01) are of greatest interest. In 1970 and 1972 there was greater inequality of sales turnover than of net profits, in 1974 the position was reversed - inequality of profits was much more pronounced. The rankings according to Ln*h and LS are identical for each year.

Matrix 2 is omitted because of absence of an equity variable relating to U.K. activities.

Matrix 3 summarises the ranking of rates of growth of each company's share of turnover and combined net profits. The absence of rank correlation is clear from the scatter in the tables, though this was more pronounced in 1970-1 (when the company with the lowest growth of sales had the highest growth of profits) than in the two subsequent comparisons. In 1974-5 the correlation between sales - and profit - growth, was more in evidence; company B (Michelin) had the fastest growth of both sales-share and profits-share and company A (Dunlop) the least growth.

For World-wide activities in 1975 Matrix 1 shows that profits are more highly concentrated on the basis of LS than is any other variable and have the lowest'score'. This finding is consistent with other results reported by Linda[1]. Matrix 2(a) shows comparative performance using net profits before tax as the criterion while 2(b) takes net cash flow. For reasons already explained, we believe that net cash flow more closely corresponds with the objectives of multi-national companies. Of the two U.K.-based companies, the Dunlop-Pirelli union ranks fourth and Avon sixth, Goodyear and Firestone headed the 1975 performance ranking but on the basis of net cash flow, Michelin was a clear leader.

The Financial Performance of Retreading Companies

The difference in scale of operations between the six major tyre manufacturers and even the largest of the retreading companies led to the exclusion of the retreaders from the concentration tables. The results of the three largest retreading companies over the survey period are compared in Table II.22 on the next page with the average for the major tyre manufacturers.

The results for the smallest company, Homerton, appear to be typical of those of the large number of small retreading concerns. The decline in the real value of sales turnover reflects both the declining importance of retreaded tyres and also the downward pressure on their prices. The high return on equity, in relation to the low profit margin, results from the absence of vertical integration - value added is small in relation to sales - and low levels of capitalisation (retreading is a labour-intensive process). In interpretation of the profits figures, it is important to recall that these are net of directors' remuneration. In the case of family-owned businesses the major shareholders may prefer to take salaries rather than dividends.

The results for all three companies follow a similar pattern. The Watts Tyre and Rubber Company is a subsidiary of Watts of Lydney Ltd.

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1 See"Methodology of Concentration Analysis...." page 43.

TABLE II.22. FINANCIAL RESULTS OF THREE LARGEST RETREADING COMPANIES

	Ondura Ltd.	Hometon Tyre & Rubber Co.Ltd.	Watts Tyre & Rubber Co.Ltd.	Average of major cos. in tyre industry
1974 Sales turnover (£000)	3,558	1,505	4,552	
Sales turnover (Index at constant purchasing power with 1969 = 100)				
1969	100	100	100	100
1970	119.5	93.8	109.0	106.2
1971	107.4	87.9	110.1	110.2
1972	102.5	80.9	105.1	107.9
1973	95.0	76.6	113.6	111.6
1974	103.7	70.5	131.0	117.8
Net Profits as % of (a) sales and (b) equity				
1969 (a)	7.0	4.4	6.1	4.4
(b)	27.0	71.4	13.2*	n.a.
1970 (a)	11.0	1.0	4.0	3.9
(b)	44.1	14.5	10.8*	n.a.
1971 (a)	9.8	1.6	7.4	4.7
(b)	34.4	16.2	17.0*	n.a.
1972 (a)	-0.5	2.1	3.5	4.0
(b)	-1.8	19.1	13.4*	n.a.
1973 (a)	-8.3	-2.5	0.5	2.8
(b)	-40.2	-26.1	9.2*	n.a.
1974 (a)	1.7	0.4	2.4	3.4
(b)	9.3	4.5	18.4*	n.a.

* Figures refer to all activities of parent company (tyres 57% of sales).

with a 1974 turnover of over £8 millions (tyres £4.5 millions). This company, which also acts as a tyre distributor, appears to have been consistently more successful than Homerton and, except in 1970 and 1971, reported better results than Ondura.

Supplementary Comparison of Replacement and OE Markets

After the analysis of concentration in the total supply of tyres using the financial variables we include a further table (No.9 on page 77). This shows the values of concentration measures derived from the market share estimates for the two distinct markets. For replacement, the Linda analysis shows growth of an oligopoly of three firms much more equal in strength in 1975 and (especially) in 1976 than in 1972. These three firms were Michelin, Pirelli and Goodyear.

In the original equipment sector the Linda analysis also shows a three-firm oligopoly though in this case the companies are Dunlop, Goodyear and Firestone.

TABLE II - 23 ECONOMIC STRUCTURE OF FIRMS IN THE SAMPLE

	TURNOVER ($m.)			PROFIT BEFORE TAX ($m.)		
	Total	Tyres World-Wide	U.K. All Products	Total	Tyres World-Wide	U.K. All Products
1970						
Avon	103.1	74.6	89.9	3.32	1.65	3.19
Dunlop/Pirelli	2303	1182	485	79.6	39.6	18.42
Firestone	2335	1910	79.7	170.6	124.7	3.48
Goodyear	3194	2650	181.7	236.0	208.8	10.82
Michelin	*		174.0	*		12.84
Uniroyal	1556	869	68.6	37.2	19.7	2.24
1972						
Avon	116.7	88.1	104.8	5.03	2.97	5.52
Dunlop/Pirelli	2747	1461	744.8	96.3	34.6	22.7
Firestone	2691	2198	96.3	250.0	190.9	0.75
Goodyear	4072	1383	81.1	354.5	323	2.40
Michelin	*		233.0	*		17.54
Uniroyal	1800	1028	79.7	75.8	38.7	0.77
1973						
Avon	135.5	96.7	116.0	5.02	2.92	4.39
Dunlop/Pirelli	3275	1698	814.6	160.6	53.7	22.1
Firestone	3155	2535	98.1	285.4	211.6	0.02
Goodyear	4675	3975	223.9	328.8	286.0	3.29
Michelin	*		283.4	*		12.84
Uniroyal	2084	1216	86.7	73.6	33.3	2.33
1975						
Avon	159.7	122.2	139.4	-1.12	0.49	-1.24
Dunlop/Pirelli	3982	2102	1025	153.3	61.6	36.9
Firestone	3939	3015	54.7	231.1	157	-2.97
Goodyear	5453	4526	292.6	316.9	244	0.20
Michelin	2902	n.a.	485.3	147.0	n.a.	52.4
Uniroyal	2188	1265	94.8	38.2	20.4	6.37

* Michelin accounts not published in consolidated form until 1975

Sources: Accounts of companies registered in USA, UK, France and Italy.

TABLES OF CONCENTRATION

TABLE 1. EVOLUTION OF THE TOTAL FIGURES FOR THE SAMPLE OF ENTERPRISES

Industry: Tyres (UK activities) Institute: Cranfield School of Management

	Sales turnover (01)			Employees (02)		
Year	No. of firms	£ millions	Index 1969=100	No. of firms	Number	Index 1969=100
1969	7	408.4	100	7	98,700	100
1970	7	462.2	113	7	104,300	106
1971	6	524.8	129	6	100,600	102
1972	6	549.2	134	6	96,200	97
1973	6	615.4	151	6	96,300	98
1974	6	753.3	184	6	96,300	98
1975	6	903.2	221	6	93,000	94

	Wages-Bill (03)			Net Profits before Tax (04)*		
Year	No. of firms	£ millions	Index 1969=100	No. of firms	£ millions	Index 1969=100
1969	7	129.8	100	5	18.98	100
1970	7	141.8	109	7	17.86	94
1971	6	153.4	118	6	24.87	131
1972	6	164.3	126	6	21.77	115
1973	6	184.6	142	6	17.00	90
1974	6	211.1	163	5	25.76	136
1975	6	259.7	200	5	43.33	228

	Advertising Expenditure (11)		
Year	No. of firms	£ millions	Index 1969=100
1969	7	2.262	100
1970	7	1.304	58
1971	6	1.873	83
1972	6	2.351	104
1973	6	2.649	117
1974	6	1.963	87
1975	6	2.428	107

*Only profits are included in this total (i.e. losses are omitted). The sum totals for all firms of profits and losses in each year were (£m):-

1969:	18.09	1973:	17.00
1970:	17.86	1974:	25.46
1971:	24.87	1975:	40.35
1972:	21.77		

VALUES OF VARIABLES IN TERMS OF 1975 PURCHASING POWER

TABLE 1 (a)

(All data in Table 1 adjusted by the Index of Retail Prices, with 1975 = 1)

YEAR	Sales Turnover £m	Sales Turnover Index	Wages-Bill £m	Wages-Bill Index	Advertising Exp. £m	Advertising Exp. Index
1969	794.2	100	248.7	100	4.525	100
1970	844.0	106	255.8	103	2.381	53
1971	875.1	110	255.8	103	3.123	69
1972	857.1	108	256.4	103	3.669	81
1973	886.2	112	265.8	107	3.815	84
1974	935.7	118	262.2	105	2.438	54
1975	903.2	114	259.7	104	2.428	54

YEAR	Net Profits (excluding losses) £m	Net Profits (excluding losses) Index	Net Profits (including losses) £m	Net Profits (including losses) Index
1969	36.90	100	35.17	100
1970	32.61	88	32.61	93
1971	41.47	112	41.47	118
1972	33.98	92	33.98	97
1973	24.48	66	24.48	70
1974	31.99	87	31.62	90
1975	43.33	117	40.35	115

EVOLUTION OF CONCENTRATION

TABLE 2
Page 1

Country: United Kingdom
Institute: Cranfield School of Management - Bedford
Sector: Tyres - Economic Activity Units
Variables (UK activities only): 01 - Turnover 02 - Employees
03 - Wages Bill 04 - Net Profits
11 - Advertising Expenditure

All variables except 02 in £ millions.

	No. of firms	Mean	Coeff. of Variation	Gini	Herfindahl-Hirschman	Entropy
YEAR 1969						
01	7	58.34	0.873	0.410	251.7	- 71.4
02	7	14,740	1.179	0.502	341.4	- 63.1
03	7	18.27	1.158	0.500	334.5	- 63.6
04	5	3.80	0.722	0.405	304.3	- 57.0
11	7	0.332	1.016	0.486	290.3	- 66.3
YEAR 1970						
01	7	66.03	0.806	0.381	235.8	- 73.1
02	7	14,900	1.144	0.503	329.8	- 63.8
03	7	20.01	1.115	0.495	320.3	- 64.6
04	7	2.68	0.699	0.375	212.8	- 73.5
11	7	0.175	1.306	0.606	386.4	- 54.2
YEAR 1971						
01	6	87.46	0.878	0.414	295.2	- 64.3
02	6	16,800	1.080	0.501	361.1	- 58.0
03	6	25.56	1.052	0.485	351.0	- 59.1
04	6	4.33	0.606	0.337	227.8	- 69.3
11	6	0.312	0.938	0.512	313.2	- 57.2
YEAR 1972						
01	6	91.5	0.857	0.410	289.2	- 64.8
02	6	16,000	1.046	0.496	349.1	- 58.8
03	6	27.4	1.024	0.479	341.5	- 59.8
04	6	3.63	0.985	0.523	328.2	- 56.3
11	6	0.392	0.612	0.339	229.2	- 68.3

EVOLUTION OF CONCENTRATION

TABLE 2
Page 2

Country: United Kingdom
Institute: Cranfield School of Management - Bedford
Sector: Tyres - Economic Activity Units
Variables (UK activities only): 01 - Turnover 02 - Employees
03 - Wages Bill 04 - Net Profits
11 - Advertising Expenditure

	No. of firms	Mean	Coeff. of Variation	Gini	Herfindahl-Hirschman	Entropy
YEAR 1973						
01	6	102.6	0.849	0.413	286.7	- 64.8
02	6	16,050	1.040	0.490	346.9	- 59.1
03	6	30.8	1.014	0.478	337.9	- 60.0
04	6	2.83	0.995	0.533	331.6	- 55.0
11	6	0.442	0.498	0.279	208.0	- 71.8
YEAR 1974						
01	6	125.5	0.836	0.410	283.1	- 65.0
02	6	16,050	1.038	0.486	346.3	- 59.3
03	6	35.2	0.996	0.478	331.9	- 60.3
04	5	5.15	0.932	0.416	373.6	- 55.0
11	6	0.327	0.676	0.348	242.9	- 63.3
YEAR 1975						
01	6	150.5	0.824	0.427	279.8	- 64.5
02	6	15,500	1.017	0.491	338.9	- 59.4
03	6	43.3	0.977	0.485	325.7	- 60.2
04	4	10.83	0.896	0.487	450.6	- 38.7
11	6	0.405	0.897	0.483	300.7	- 59.7

LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

TABLE 3
Page 1

Sector: Tyres (UK activities)

	L and CR for N* = 2	L and CR for N* = 4	Maximum and Minimum Values of L: Size of sample	Maximum: N*h	Maximum: L	1st Minimum: N*m	1st Minimum: L
Variable 01 - Sales Turnover							
1969 L	1.373	0.734	7	2	1.373	7	0.530
CR	58.8	82.5					
1970 L	1.243	0.702	7	2	1.243	7	0.472
CR	57.0	80.8					
1971 L	1.446	0.827	6	2	1.446	6	0.635
CR	64.7	87.5					
1972 L	1.333	0.825	6	2	1.336	6	0.623
CR	64.8	87.2					
1973 L	1.237	0.814	6	2	1.237	6	0.633
CR	65.3	88.8					
1974 L	1.176	0.811	6	2	1.176	3	0.811
CR	65.3	87.7					
1975 L	0.900	0.829	6	2	0.900	5	0.761
CR	72.3	89.2					
Variable 02 - Employment							
1969 L	1.980	1.015	7	2	1.980	7	0.838
CR	68.6	86.6					
1970 L	1.757	0.989	7	2	1.757	7	0.744
CR	68.5	86.8					
1971 L	1.632	1.007	6	2	1.632	6	0.917
CR	72.7	91.6					
1972 L	1.463	0.989	6	2	1.463	6	0.910
CR	72.6	91.6					
1973 L	1.505	0.970	6	2	1.505	6	0.884
CR	71.9	91.3					
1974 L	1.510	0.963	6	2	1.510	6	0.870
CR	71.9	90.9					
1975 L	1.362	0.950	6	2	1.362	5	0.896
CR	72.0	91.7					

LINDA INDICES (L) AND CONCENTRATION RATIOS (CR)

TABLE 3
Page 2

	L and CR for N* = 2	L and CR for N* = 4	Maximum and minimum values of L: Size of sample	Maximum: N*h	Maximum: L	1st Minimum: N*m	1st Minimum: L
Variable 03 - Wages Bill							
1969 L	1.963	0.987	7	2	1.963	7	0.683
CR	67.7	86.7					
1970 L	1.738	0.950	7	2	1.738	7	0.725
CR	67.1	86.7					
1971 L	1.726	0.957	6	2	1.726	6	0.863
CR	70.6	91.0					
1972 L	1.576	0.968	6	2	1.576	5	0.846
CR	70.6	90.4					
1973 L	1.570	0.938	6	2	1.570	6	0.849
CR	70.0	90.7					
1974 L	1.411	0.937	6	2	1.411	5	0.852
CR	70.6	90.8					
1975 L	1.157	0.959	6	2	1.157	3	0.886
CR	72.3	91.4					
Variable 04 - Net Profits Before Tax							
1969 L	0.638	0.751	7 /	2	0.638	3	0.596
CR	72.2	98.0					
1970 L	0.584	0.542	7	2	0.585	3	0.380
CR	52.9	84.6					
1971 L	0.576	0.530	6	2	0.577	3	0.457
CR	58.1	87.9					
1972 L	0.659	0.840	6	3	0.919	4	0.840
CR	77.9	97.2					
1973 L	0.652	0.860	6	3	0.893	4	0.860
CR	78.3	97.7					
1974 L	2.036	0.895	5	2	2.036	5	0.777
CR	71.0	93.0					
1975 L	0.702	14.49	4	4	14.491	No value	
CR	93.1	100.0					

LINDA INDICES (L) AND CONCENTRATION RATIOS (CR) TABLE 3
Page 3

	L and CR for N* = 2	L and CR for N* = 4	Maximum and minimum values of L: Size of sample	Maximum: N*h	Maximum: L	1st Minimum: N*m	1st Minimum: L
Variable 11 - Expenditure on Advertising							
1969 L	1.453	0.732	7	2	1.453	4	0.732
CR	63.9	89.0					
1970 L	1.839	0.905	7	2	1.839	4	0.905
CR	73.7	95.6					
1971 L	0.739	0.717	6	3	0.757	4	0.717
CR	73.8	97.9					
1972 L	0.815	0.413	6	2	0.815	5	0.413
CR	55.4	88.6					
1973 L	0.562	0.423	6	2	0.562	5	0.360
CR	53.4	84.4					
1974 L	0.550	0.291	6	2	0.550	4	0.291
CR	53.1	98.1					
1975 L	1.000	0.658	6	2	1.000	3	0.655
CR	67.6	96.5					

STRUCTURE OF LINDA CURVES (TYRES - U.K. ACTIVITIES)

TABLE 3 (bis)
Page 1

	N*	01-Sales Turnover	02 Employment	03 Wages-Bill	04 Net Profits	11 Advertising
1969	2	1.373	1.980	1.963	0.638	1.453
	3	0.776	1.347	1.226	0.596	0.842
	4	0.734	1.015	0.987	0.751	0.732
	5	0.626	0.944	0.908	1.270	0.811
	6	0.589	0.838	0.828		0.805
	7	0.530	0.728	0.730		0.760
1970	2	1.243	1.757	1.738	0.585	1.839
	3	0.726	1.236	1.108	0.380	1.214
	4	0.702	0.989	0.950	0.542	0.905
	5	0.609	0.906	0.875	0.514	1.013
	6	0.537	0.817	0.802	0.520	2.619
	7	0.472	0.743	0.725	0.547	5.024
1971	2	1.446	1.632	1.726	0.577	0.739
	3	0.863	1.206	1.121	0.457	0.757
	4	0.827	1.007	0.957	0.530	0.717
	5	0.714	0.975	0.897	0.501	1.305
	6	0.635	0.917	0.863	0.560	3.409
1972	2	1.333	1.463	1.576	0.659	0.815
	3	0.850	1.130	1.085	0.919	0.526
	4	0.825	0.989	0.967	0.840	0.444
	5	0.702	0.943	0.846	1.609	0.413
	6	0.623	0.910	0.850	1.696	0.950
1973	2	1.237	1.505	1.570	0.652	0.562
	3	0.827	1.129	1.037	0.893	0.466
	4	0.814	0.970	0.938	0.860	0.422
	5	0.721	0.917	0.849	1.258	0.359
	6	0.633	0.884	0.849	12.686	0.491

STRUCTURE OF LINDA CURVES (TYRES - U.K. ACTIVITIES)

TABLE 3 (bis)
Page 2

	N*	01-Sales Turnover	02 Employment	03 Wages-Bill	04 Net Profits	11 Advertising
1974	2	1.176	1.510	1.411	2.036	0.550
	3	0.8106	1.175	1.013	1.222	0.390
	4	0.8114	0.963	0.937	0.895	0.291
	5	0.715	0.887	0.852	0.777	1.044
	6	0.628	0.870	0.857		3.285
1975	2	0.900	1.362	1.157	0.702	1.000
	3	0.761	1.057	0.897	1.572	0.655
	4	0.829	0.950	0.959	14.491	0.658
	5	0.747	0.896	0.886		1.033
	6	0.696	0.924	0.900		1.687

SUMMARY OF LINDA INDICES

TABLE 4

	01 Sales Turnover	02 Employment	03 Wages Bill	04 Net Profits	11 Advertising
1969 N*m	7	7	7	3	4
LN*m	0.530	0.728	0.730	0.596	0.732
LS	0.771	1.142	1.107	0.617	1.009
1970 N*m	7	7	7	3	4
LN*m	0.472	0.743	0.725	0.380	0.905
LS	0.715	1.075	1.033	0.482	1.319
1971 N*m	6	6	6	3	4
LN*m	0.635	0.917	0.863	0.457	0.717
LS	0.897	1.147	1.113	0.517	0.738
1972 N*m	6	6	5	4	4
LN*m	0.623	0.910	0.846	0.840	0.413
LS	0.867	1.087	1.118	0.816	0.550
1973 N*m	6	6	6	4	5
LN*m	0.633	0.884	0.849	0.860	0.359
LS	0.846	1.081	1.050	0.802	0.452
1974 N*m	3	6	5	4	4
LN*m	0.811	0.870	0.852	0.777	0.291
LS	0.994	1.081	1.053	1.483	0.410
1975 N*m	3	5	5	No value (curve rises throughout)	3
LN*m	0.761	0.896	0.886		0.655
LS	0.831	1.066	0.997		0.828

PROFITABILITY RATIOS

TABLE 5
Page 1

R1: Profit margin = $\frac{\text{Net profit before tax}}{\text{Sales turnover}} \times 100$

	1969	1970	1971	1972	1973	1974	1975
(a) All activities in the U.K.							
Avon	1.13	3.55	6.03	4.33	4.14	3.18	-0.9
Dunlop*	4.36	2.43	3.20	3.72	2.63	4.26	4.27
Firestone	4.65	4.38	5.74	0.77	0.03	-0.62	-5.43
Goodyear	5.46	5.96	6.68	2.96	1.47	3.22	0.07
Michelin	9.50	7.38	8.03	7.53	5.00	2.11	10.79
Uniroyal	-3.12	3.26	3.69	0.96	1.10	5.95	6.73
Pirelli	-1.04	0.74	I N C L U D E D	W I T H	D U N L O P		
OVERALL AVERAGE+	4.43	3.86	4.74	3.96	2.76	3.38	4.47
(b) All activities world-wide.							
Avon	1.23	3.22	4.97	4.31	4.19	3.03	-0.7
Dunlop*	5.54	4.98	6.51	6.27	4.76	4.95	5.12
Firestone	9.48	7.31	9.06	9.29	9.05	7.39	6.15
Goodyear	9.30	7.32	8.86	8.71	7.03	5.41	5.81
Michelin	N O T	A V A I L A B L E	U N T I L	1 9 7 5	-		5.07
Uniroyal	5.25	2.39	4.27	4.21	3.53	3.33	1.75
(c) Tyres world-wide.							
Avon		3.01	7.4	4.53	2.8	2.08	-0.6
Dunlop*		5.43	7.22	6.69	4.68	4.11	5.07
Firestone		5.36	8.61	8.69	8.32	5.74	5.17
Goodyear		7.84	9.59	9.33	7.2	5.1	5.39
Uniroyal		2.11	4.52	3.46	2.06	1.1	1.3

* Includes all tyre interest of Pirelli from 1971 onwards.

+ Total of net profits and losses combined turnover.

TABLE 5
Page 2

Further profitability ratios relating to all activities, world-wide.

R2: Net return on equity = $\frac{\text{Net profits before tax}}{\text{Total equity ("own capital")}} \times 100$

	1969	1970	1971	1972	1973	1974	1975
Avon	3.31	10.22	16.4	14.43	15.22	13.81	-3.79
Dunlop*	15.98	15.45	14.1	15.66	12.33	13.11	14.56
Firestone	20.31	15.4	19.07	19.97	21.03	18.69	14.98
Goodyear	23.79	17.62	22.24	22.61	19.84	16.45	17.45
Michelin							5.07
Uniroyal	15.42	6.9	12.71	12.96	12.15	12.25	6.10
R3: Gross cash flow in relation to sales = $\frac{\text{Net profits before tax + depreciation}}{\text{Sales turnover}} \times 100$							
Avon	4.72	6.32	8.04	7.44	7.24	5.64	1.86
Dunlop*	8.99	8.5	10.14	10.14	8.60	8.39	8.3
Firestone	13.44	10.76	13.12	13.21	12.84	11.1	10.24
Goodyear	12.75	11.13	12.5	12.29	10.38	8.68	9.14
Michelin							12.47
Uniroyal	8.34	5.64	7.4	7.31	6.39	6.15	4.90
R4: Gross cash flow in relation to equity = $\frac{\text{Net profits before tax + depreciation}}{\text{Total equity("own capital")}} \times 100$							
Avon	12.72	20.03	26.53	24.87	26.27	25.76	10.09
Dunlop*	25.94	26.37	21.96	25.31	22.28	22.21	23.58
Firestone	28.78	22.67	27.62	28.39	29.85	28.06	24.95
Goodyear	32.61	26.78	31.39	31.92	29.3	26.4	27.44
Michelin							38.32
Uniroyal	24.5	16.26	22.05	22.48	21.97	22.63	17.11

* Includes all tyre interests of Pirelli from 1971 onwards.

TABLE 5
Page 3

Further profitability ratios relating to all activities, worldwide.

R5: Net cash flow in relation to sales = $\frac{\text{Net profits after tax + depreciation}}{\text{sales turnover}} \times 100$

	1969	1970	1971	1972	1973	1974	1975
Avon	4.4	5.03	6.23	6.24	5.37	4.06	2.06
Dunlop*	6.4	5.88	7.0	7.26	6.0	5.64	5.49
Firestone	9.07	7.42	8.63	8.96	9.02	7.89	7.7
Goodyear	8.27	7.76	8.17	8.31	7.13	6.02	6.29
Michelin							10.68
Uniroyal	6.1	4.83	5.7	5.69	5.14	4.7	4.21
R6: Net cash clow in relation to equity = $\frac{\text{Net profit after tax + depreciation}}{\text{Total equity}} \times 100$							
Avon	11.86	15.95	20.56	20.88	19.49	18.51	11.17
Dunlop*	18.46	18.26	15.17	18.13	15.54	14.93	15.6
Firestone	19.43	15.64	18.16	19.27	20.97	19.96	18.75
Goodyear	21.16	18.66	20.51	21.59	20.11	18.31	18.89
Michelin							32.82
Uniroyal	17.92	13.92	16.98	17.5	17.69	17.28	14.69

* Includes all tyre interests of Pirelli from 1971 onwards.

PATTERN OF GROWTH OF FIRMS WITHIN THE SAMPLE — TABLE 6

(Tyre companies - U.K. activities)

	Absolute change in % shares			
	01 Sales Turnover	02 Employees	03 Wages-Bill	04 Net Profits
1969-70				
Avon	-0.05	-0.30	-0.24	+5.10
Dunlop	-2.43	-1.44	-1.83	-16.11
Firestone	-0.18	+0.15	-0.91	-4.02
Goodyear	+0.68	+0.62	+0.85	-10.69
Michelin	+0.17	+1.34	+1.25	-7.74
Uniroyal	+0.95	-0.66	-0.20	+28.49
Pirelli	+0.85	+0.29	+1.08	+4.97
Index of Dynamism	2.66	2.40	3.18	38.56
1970-1				
Avon	-0.36	-0.04	+0.35	+2.34
Dunlop (of Dunlop+Pirelli)	+1.61	-2.82	-2.61	+1.77
Firestone	-0.35	+0.36	+1.02	+4.57
Goodyear	-1.29	+0.58	+0.36	+12.63
Michelin	+0.92	+1.89	+0.86	+2.97
Uniroyal	-0.52	+0.03	-0.01	-24.27
Index of Dynamism	2.52	2.86	2.61	24.27
1971-2				
Avon	-0.12	-0.26	-0.47	-1.08
Dunlop	-0.94	-1.60	-1.21	+13.15
Firestone	+0.18	+0.22	+0.79	-6.55
Goodyear	-0.31	+0.36	-0.05	-9.34
Michelin	+1.07	+1.43	+1.13	+6.62
Uniroyal	+0.13	-0.15	-0.20	-2.82
Index of Dynamism	1.37	2.01	1.93	19.78

PATTERN OF GROWTH OF FIRMS WITHIN THE SAMPLE

TABLE 6
Page 2

	01 Sales Turnover	02 Employees	03 Wages-Bill	04 Net Profits
1972-3				
Avon	+0.02	+0.25	+0.13	+3.13
Dunlop	-0.64	-0.10	-0.47	+0.04
Firestone	-0.51	+0.19	-0.31	-1.31
Goodyear	+0.07	+0.11	+0.71	-3.12
Michelin	+1.11	-0.56	-0.08	+0.39
Uniroyal	-0.05	+0.11	+0.02	+0.87
Index of Dynamism	1.20	0.66	0.86	4.43
1973-4				
Avon	-0.11	+0.35	-0.17	-4.46
Dunlop	-0.68	+0.02	-0.99	+12.69
Firestone	+0.06	+0.37	-0.08	-0.06
Goodyear	+0.02	-0.66	-0.23	+6.09
Michelin	+0.68	-0.05	+1.55	-21.96
Uniroyal	+0.01	-0.02	-0.09	+7.72
Index of Dynamism	0.78	0.74	1.55	26.49
1974-5				
Avon	-0.59	-0.53	-0.49	-7.02
Dunlop	-2.29	-1.32	-1.65	-18.21
Firestone	-0.50	-0.26	-0.37	0.00
Goodyear	-0.28	+1.15	-0.62	-13.78
Michelin	+4.71	+1.46	+3.35	+42.38
Uniroyal	-1.04	-0.51	-0.22	-3.38
Index of Dynamism	4.71	2.62	3.35	42.38

TABLE 6(a)

U.K. ACTIVITIES OF TYRE COMPANIES
% DISTRIBUTION OF EACH VARIABLE BY ENTERPRISES

	01	02	03	04
1969				
Avon	8.16	8.14	7.85	1.99
Dunlop	43.10	54.76	53.95	40.47
Firestone	7.36	4.16	5.14	7.37
Goodyear	15.69	9.89	11.18	18.42
Michelin	15.52	13.83	13.75	31.74
Uniroyal	5.24	4.33	3.97	0
Pirelli	4.93	4.89	4.18	0
1970				
Avon	8.11	7.84	7.61	7.09
Dunlop	40.67	53.32	52.12	24.36
Firestone	7.18	4.31	4.23	3.35
Goodyear	16.37	10.51	12.03	7.73
Michelin	15.69	15.17	15.00	24.00
Uniroyal	6.19	3.67	3.77	28.49
Pirelli	5.78	5.18	5.26	4.97
1971				
Avon	7.75	7.80	7.96	9.43
Dunlop/Pirelli	48.06	55.68	54.77	31.10
Firestone	6.83	4.67	5.25	7.92
Goodyear	15.08	11.09	12.39	20.36
Michelin	16.61	17.06	15.86	26.97
Uniroyal	5.67	3.70	3.77	4.23

U.K. ACTIVITIES OF TYRE COMPANIES
% DISTRIBUTION OF EACH VARIABLE BY ENTERPRISES

TABLE 6(a)
Page 2

	01	02	03	04
1972				
Avon	7.63	7.54	7.49	8.35
Dunlop	47.12	54.08	53.56	44.25
Firestone	7.01	4.89	6.04	1.37
Goodyear	14.77	11.45	12.34	11.02
Michelin	17.68	18.49	16.99	33.59
Uniroyal	5.80	3.55	3.57	1.41
1973				
Avon	7.65	7.79	7.62	11.48
Dunlop	46.48	53.98	53.09	44.29
Firestone	6.50	5.08	5.73	0.06
Goodyear	14.84	11.56	13.07	7.90
Michelin	18.79	17.93	16.91	33.98
Uniroyal	5.75	3.66	3.59	2.28
1974				
Avon	7.54	8.14	7.45	7.02
Dunlop	45.80	54.00	52.10	56.98
Firestone	6.56	5.45	5.65	0
Goodyear	14.86	10.90	12.84	13.99
Michelin	19.47	17.88	18.46	12.02
Uniroyal	5.76	3.64	3.50	10.00
1975				
Avon	6.95	7.61	6.96	0
Dunlop	43.51	52.68	50.45	38.77
Firestone	6.06	5.19	5.28	0
Goodyear	14.58	12.05	12.22	0.21
Michelin	24.18	19.34	21.81	54.40
Uniroyal	4.72	3.13	3.28	6.62

TABLES OF CONCENTRATION — TABLE 7

Analysis of World-Wide Figures for Sample of Enterprises 1975

Industry: Tyres
Unit: Millions of U.S. dollars

Institute: Cranfield School of Management

Figures refer to world-wide turnover of the six firms producing tyres in the United Kingdom.

	01 Turnover	04 Net Profits	05 Cash Flow	07 Own Capital	09 Net Cash Flow	10 Net Assets
Total	18,624	887	1,613	5,856	1,203	12,217
Mean	3,104	177.3	268.8	976	200.5	2,036
Coeff. of Variation	0.535	0.524	0.629	0.597	0.618	0.531
Gini	0.294	0.289	0.352	0.332	0.343	0.283
Herf-Hirschman	214.3	255.0	232.6	226.0	230.2	213.6
Entropy	- 69.5	-63.2	-66.2	- 67.9	- 66.7	- 68.8
Concentration ratios						
N = 1	0.293	0.357	0.309	0.310	0.285	0.256
2	0.507	0.618	0.547	0.571	0.543	0.495
3	0.718	0.791	0.771	0.732	0.783	0.703
4	0.874	0.957	0.932	0.888	0.921	0.898
5	0.991	1.000	0.998	0.995	0.997	0.997
6	1.000		1.000	1.000	1.000	1.000
Linda coefficients						
N = 2	0.685	0.685	0.650	0.594	0.554	0.536
3	0.429	0.573	0.426	0.540	0.380	0.390
4	0.369	0.434	0.376	0.415	0.390	0.302
5	0.343	0.637	0.469	0.388	0.442	0.337
6	1.109		4.121	1.702	2.896	2.265
LS	0.456	0.564	0.484	0.484	0.467	0.409

TABLE 8 WORLD WIDE ACTIVITIES OF TYRE PRODUCERS

FINANCIAL DATA FOR YEAR 1975
(Financial year ended in period 1st July 1974 to 30th June 1975)

Variable	Avon	Dunlop & Pirelli	Firestone	Goodyear	Michelin	Uniroyal
		(millions of U.S. dollars)				
01 Turnover	160	3982	3939	5453	2902	2188
04 Net Profits	- 1	153	231	317	147	38
05 Cash Flow	3	259	384	499	362	107
07 Equity	30	911	1529	1816	944	626
09 Net cash flow	3	166	289	343	310	92
10 Net assets	42	2537	2918	2387	3187	1205

Source: Company accounts.

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

Tyre industry :- UK Activities

(Matrix No. 2 omitted - see p.50 of text)

Matrix No. 1 Oligopolistic Inequality 1970

Ranking		Ranking 1	1	2	3	4	5
		Variable	11	02	03	01	04
II	Variable	LS/Ln*h	1.839	1.757	1.738	1.243	0.585
1	11	1.319	2				
2	02	1.075		4			
3	03	1.033			6		
4	01	0.715				8	
5	04	0.482					10

Ranking		Ranking 1	1972 1	2	3	4	5
		Variable	03	02	01	04	11
II	Variable	LS/Ln*h	1.576	1.463	1.333	0.919	0.815
1	03	1.118	2				
2	02	1.087		4			
3	01	0.867			6		
4	04	0.816				8	
5	11	0.550					10

Ranking		Ranking 1	1974 1	2	3	4	5
		Variable	04	02	03	01	11
II	Variable	LS/Ln*h	2.036	1.510	1.411	1.176	0.550
1	04	1.483	2				
2	02	1.081		4			
3	03	1.053			6		
4	01	0.994				8	
5	11	0.410					10

01 = Sales Turnover
02 = Employees
03 = Wages Bill
04 = Net Profits Before Tax
11 = Advertising expenditure

MATRIX NO.3 - COMPARATIVE GROWTH RATES

(see next page for definitions)

4c \ 1c	1970-1 Rank	1	2	3	4	5	6
	Company	A	B	E	D	F	C
	1c	1.61	0.92	-0.35	-0.36	-0.52	-1.29
4x \ 1x		47	16	7	8	6	16
Rank	Company	4c					
1	C	12.63	8				7
2	E	4.57	3			5	
3	B	2.97	24		5		
4	D	2.34	7			8	
5	A	1.77	29	6			
6	F	-24.27	29				11

4c \ 1c	1972-3 Rank	1	2	3	4	5	6
	Company	B	C	D	F	E	A
	1c	1.11	0.07	0.02	-0. 5	-0.51	-0.64
4x \ 1x		18	15	7	6	7	47
Rank	Company	4c					
1	D	3.13	8			4	
2	F	0.87	2				6
3	B	0.39	34	4			
4	A	0.04	44				10
5	E	-1.31	1				
6	C	-3.12	11		8		

4c \ 1c	1974-5 Rank	1	2	3	4	5	6
	Company	B	C	E	D	F	A
	1ci	4.71	-0.28	-0.50	-0.59	-1.04	-2.29
4x \ 1x		24	15	6	7	5	43
Rank	Company	4ci					
1	B	42.38	54	2			
2	E	0.00	0			5	
3	F	-3.38	7				8
4	D	-7.02	0				8
5	C	-13.78	0		7		
6	A	-18.21	39				12

1c = Growth (croissance) of share of sales turnover (market share)

4c = Growth (croissance) of share of net profits

1x = Share of sales turnover in the first of the two years

4x = Share of the net profits in the first of the two years

Companies (ranked in order of 1971 sales turnover)

A - Dunlop/Pirelli

B - Michelin

C - Goodyear

D - Avon

E - Firestone

F - Uniroyal

The terms used are those of R. Linda. (Reference 3)

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE
World-wide Activities of Tyre Companies with Major Shares of U.K. Market - 1975

Matrix No. 1 Oligopolistic Inequality

Ranking		Ranking I	1	2	3	4	5	6
		Variable	01	04	05	07	09	10
II	Variable	LS/Lh*h	0.685	0.685	0.650	0.594	0.554	0.536
1	04	0.564		3				
2	07	0.484				6		
3	05	0.484			6			
4	09	0.467					9	
5	01	0.456	6					
6	10	0.409						12

(Rankings are based on unrounded values)

Matrix No. 2 (a) Comparative Performance (using net profits before tax)

2r \ 1r			Rank	1	2	3	4	5	6
			Firm	C	A	B	D	E	F
			1r	6.2	5.8	5.1	5.1	1.8	-0.7
Rank	Firm	2r	7x \ 1x	3939	5453	3982	2902	2188	160
1	A	17.4	1816		3				
2	D	15.6	944				6		
3	C	15.0	1528	4					
4	B	14.6	911			7			
5	E	6.1	626					10	
6	F	-3.8	30						12

Notes: 1r = net profits before tax as % of sales turnover
2r = net profits before tax as % of equity
1x = absolute value of sales turnover in 1975 ($\$10^6$)
7x = absolute value of equity in 1975 ($\$10^6$)
The identity of firms is given on the next page.

MATRIX 2 (b) - COMPARATIVE PERFORMANCE (USING NET CASH FLOW AFTER TAX)

5r / 6r			Rank	1	2	3	4	5	6
			Firm	D	C	A	B	E	F
			5r	10.7	7.7	6.3	5.5	4.2	2.06
Rank	Firm	6r	7x \ 1x	2902	3939	5453	3982	2188	160
1	D	32.8	944	2					
2	A	18.9	1816			5			
3	C	18.7	1528		5				
4	B	15.6	911				8		
5	E	14.7	626					10	
6	F	11.2	30						12

Firms are coded in descending order of sales turnover in 1975:

A = Goodyear
B = Dunlop/Pirelli Union
C = Firestone
D = Michelin
E = Uniroyal
F = Avon

$$5r = \frac{\text{Net profits after tax + depreciation}}{\text{Sales turnover}}$$

$$6r = \frac{\text{Net profits after tax + depreciation}}{\text{Total equity}}$$

TABLES OF CONCENTRATION - TABLE 9 (SUPPLEMENTARY TABLE)

APPLICATION OF CONCENTRATION MEASURES TO MARKET SEGMENTS
(Based on market shares shown on pages 37 and 39 of text)

1. Replacement Market

		1972	1975	1976
N* (sample)		6	6	6
N (Estd. total number of suppliers - see Note)		14	18	19
Coefficient of variation		1.26	1.43	1.53
Gini coefficient		0.611	0.636	0.649
Herfindahl-Hirschman		185	169	176
Entropy		- 84.8	- 91.5	
Concent.ratios and Linda indices	n*	CR / L	CR / L	CR / L
	2	53 / 0.560	47 / 0.737	49 / 0.565
	3	67 / 0.555	66 / 0.452	69 / 0.406
	4	79 / 0.462	76 / 0.464	80 / 0.426
	5	87 / 0.447	83 / 0.465	84 / 0.598
	6	92 / 0.470	88 / 0.470	87 / 0.662
LS		0.506	0.595	0.486

Note:- the percentage of the market held by the N-N* firms was estimated. The assumption that this was shared by firms each holding 1% was consistent with the market structure and was used to estimate N and for the calculations of V, G, H and E.

2. Original equipment (1975 only) N = N* = 6

Coefficient of Variation = 0.533
Herfindahl-Hirschman = 214
Gini coefficient = 0.290
Entropy index = 71.1

Concentration ratios and Linda indices

n* =	2	3	4	5	6
CR	52	76	87	95	100
L	0.540	0.364	0.428	0.439	0.476

III. SPARKING PLUGS

A. Analysis of Total Market

The production of sparking plugs in the United Kingdom is now more concentrated than that of tyres. The 1968 Census of Production listed six manufacturers. Lucas have since withdrawn from the production of sparking plugs, and two smaller producers were combined within Smiths Industries Ltd. which subsequently withdrew from the U.K. market. Thus there are now only three major suppliers - the Champion Sparking Plug Company, Autolite (a division of Ford) and A.C.Delco (a subsidiary of General Motors.

Data on production of sparking plugs are rather limited: the Business Statistics Office figures relate only to the value of turnover. From the evidence of the 1968 Census of Production, published trade figures, estimates received from within the motor industry and the E.I.U. report (1), we have derived the following estimates of volume:-

Table III-1 Volume of Production, Exports and Imports of Spark Plugs

Millions of units

	U.K.production	Exports	Imports	U.K.Sales*
1968	94.3	37.4 *	na	na
1972	102.1	45.1	7.6	64.6
1973	112.1	57.4	12.6	67.3
1974	94.5 *	50.9	20.6	64.2
1975	94.4 *	40.6	8.7	62.5

Notes: U.K. sales = U.K. production - exports + imports

* estimated, not published.

Total revenue derived from the sale of sparking plugs at current prices and in terms of 1975 purchasing power is shown in Table III-2.

Table III-2. Total value of sales of Sparking Plugs

Sales Value £000's

Year	Current prices	At 1975 purchasing power	Estimated average price (new pence)*
1968	10,517	21,741	11.2
1973	18,339	26,420	16.4
1974	19,031	23,631	20.1
1975	24,437	24,437	25.9

* Derived by dividing sales revenue at current prices by the total production estimate shown in Table III-1.

These tables show that the recession in the motor industry had a greater effect on the volume of sparking plugs sold than on sales revenue: between 1973-5 the volume fell by 15.8 per cent but the "real" value of sales revenue by only 6.8 per cent. This is because the decline was mainly in the less profitable OE and direct export markets. Unlike the corresponding market for tyres, replacement demand for sparking plugs has not been reduced by any major extension of product life and has risen in proportion to the number of cars and light goods vehicles in use.

Sales of sparking plugs can be divided into three categories:- sales to vehicle manufacturers in the U.K. (OE), sales to overseas buyers (who may include overseas vehicle manufacturers) and sales to the U.K. replacement market.

An attempt to estimate the prices obtained by manufacturers for sales to each of these segments was not successful because of insufficient information about the margins of intermediaries. The average price per plug exported in 1975 was 18p so that the average per plug sold at home was 31.5p but it was not possible to separate the two domestic segments.

B. Foreign Trade

Interpretation of the foreign trade statistics is complicated by the multinational structure of the three major companies in Britain. The largest producer is the Champion Sparking Plug Co. Ltd., which is a subsidiary of the U.S. company with the same name,with other subsidiaries elsewhere in Europe. The other two producers, Autolite and A.C. Delco Ltd. are parts of the Ford and General Motors companies. Marketing and distribution of sparking plugs by General Motors (Europe) are organised on a European basis - the company is the market leader in France and replacement plugs for French-built cars are imported into the U.K. The Ford company's approach is believed to be similar.The large volume of international trade partly reflects shipments by the big companies.

B. Foreign Trade (Cont'd)

One British manufacturer, Smiths Industries Ltd., makes sparking plugs for export only under the KLG brand. Most of these are special purpose plugs and the quantities are small in comparison with shipments by the three largest producers. This company is a large exporter of plant and equipment for the manufacture of sparking plugs.

A recent development has been the growth of competitive imports but, because of shipments by Champion, Ford and General Motors this is difficult to quantify. From discussions within the industry, we believe that competitive imports may have reached a peak in 1974 from which there has been some decline because of surplus supply of sparking plugs within the U.K.

Table III-3 shows the volume and value of trade in sparking plugs annually from 1972 to 1975 (data for before 1972 are incomplete):-

Table III-3. Trade in Sparking Plugs 1972-5

		1972	1973	1974	1975
Exports	million units	45.08	57.39	50.89	40.57
	£000	5830	8200	8060	7386
Imports	million units	7.56	12.60	20.61	8.72
	£000	877	1803	3187	1553

Source: Overseas Trade Statistics

The destinations of exports show the importance of overseas assembly of U.K.-designed vehicles and the "pan-European" operations of the large producers. In 1975 over 58% of total volume (59% in value) went to Europe, the largest consignment (15% of total exports) went to Belgium, where Leyland, Ford and General Motors have assembly plants linked with U.K. manufacturing units. Other European countries importing large volume from the U.K. were the Netherlands, Germany and Sweden. Outside Europe countries taking more than 2% of total exports (800,000 plugs) were Canada, Nigeria, the U.S.A., Algeria and Iran.

B. Foreign Trade (Cont'd)

A breakdown of the origins of imports is not published but it is know n that the major sources of competitive imports are Germany (Bosch), Japan (NGK) and France (Marechal).Total competitive imports in 1975 amounted to about 11 per cent of the U.K. replacement demand for plugs or about 6.3 million units. It is not possible to determine how much of the contraction of imports between 1974 and 1975 was due to changes in the pattern of shipments by the three main companies with U.K.plants and how much was due to a decline in competitive imports.

In Europe as a whole the relative strengths of the major producers differ from those in the United Kingdom, which are described in the rest of this section. General Motors, Bosch and Champion are the three largest companies but share less than 50% of the total market. The French firm Marechal has been increasing supply and the Japanese company NGK has also gained a growing share of the market.

C. The Original Equipment Market

Vauxhall buys exclusively from A.C. Delco (General Motors) and Ford from Autolite. Champion is the sole supplier to Leyland and Chrysler.

Because of the capital-intensive nature of sparking-plug production, with high investment in expensive plant and equipment, pricing raises interesting issues. Marginal costs are relatively low and the prospect of some brand-loyalty in the replacement sector encourages sparking plug manufacturers to seek OE sales. Both the Champion company and overseas suppliers have attempted to sell to Vauxhall or Ford offering plugs at "give-away" prices. We understand that transfer-pricing within General Motors and Ford is based on standard rather than marginal costs.

Stock levels of sparking plugs held by vehicle manufacturers average about one week's requirements. This is partly because supplies can fairly easily be obtained from intermediaries in the replacement market in an emergency.

C. The Original Equipment Market (Cont'd)

Fluctuations in orders create problems for sparking plug manufacturers but these are less serious than those of tyre manufacturers because there is less product variety and stocking is easier.

In estimating the size of the United Kingdom OE market, we have included as petrol-driven vehicles (and therefore using sparking-plugs) all cars (ignoring a small number of diesel taxis produced by Leyland), car-derived commercial vehicles and other goods vehicles with gross vehicle weight of less than three tons. The total number of commercial vehicles included varied from 200 - 253,000. Cars and goods vehicles exported in unassembled form were excluded.

Assuming an average of 450 plugs per 100 vehicles we estimate OE demand as follows:-

Table III-4. Original Equipment Sales of Sparking Plugs

1968	8.3	(million units)
1972	8.46	"
1973	7.43	"
1974	6.84	"
1975	5.37	"

Market shares in the original equipment market can be estimated from those of the four major producers of petrol-driven vehicles in the United Kingdom. In both 1968 and 1975 these four made 99.4 per cent of all cars produced in the U.K. The distribution among the big four of sales of car-derived vans and other petrol-driven commercial vehicles or of cars exported without sparking plugs but included in the production figures cannot be determined with any accuracy. Unless these distributions are very markedly different from that of total car production, any distortion resulting from the use of the latter to indicate purchases of sparking plugs will be slight.

C. The Original Equipment Market (Cont'd)

Table III-5. Shares of O.E. Market (Percentages)

	Champion (Leyland & Chrysler)	Autolite (Ford)	A.C. Delco (Vauxhall)
1971	67.4	21.1	11.5
1972	61.8	28.6	9.6
1973	65.8	26.2	8.0
1974	65.8	25.2	9.0
1975	66.0	26.2	7.8

Source: SMMT (annual copies of the Motor Industry in Great Britain)

D. The replacement Market

Vehicle manufacturers normally recommend replacement of sparking plugs after 12,000 miles (19,200 kilometres) or twelve months of use, whichevever occurs first. Some postponement of servicing occurs, especially when vehicles have not been intensively used. Sales of plugs tend to vary between about 3.5 to 4.2 per vehicle in use, whereas rigorous adherence to the above recommendation would imply a minimum of around 4.5 plugs per vehicle.

The rapid increases in vehicle servicing charges in recent years has led many car owners to undertake much of their own maintenance, including the comparatively simple task of replacement of sparking plugs. This has affected the pattern of distribution: outlets such as accessory shops, petrol filling stations and chain stores have gained sales at the expense of garages and other vehicle repairers.

There are a number of links between the plug manufacturers, intermediaries and ultimate outlets which affect competition in the replacement sector of the market.

Champion as the sole supplier to Leyland and Chrysler has its plugs distributed via the distributor/dealer network of those companies under the brand names Unipart and Mopar. (Chrysler also distributes Champion plugs with the Champion brand name). Lucas, having withdrawn from manufacture several years ago, distributes Champion plugs under the Lucas name.

D. The replacement market (Cont'd)

Esso and Shell/BP rely upon Champion for supplies for sale, under the oil companies' names, at filling stations. Many of the Champion plugs distributed in packaging bearing other brand-names are marked themselves with the word "Champion", which may encourage consumer loyalty.

A.C.Delco plugs are distributed via the Vauxhall dealer/ distributor network and are therefore normally fitted to cars and vans serviced by Vauxhall dealers.

Autolite plugs are distributed in the same way by Ford and are also sold under the Motorcraft label, which Ford uses as a medium for selling spare parts for Ford and other cars. Motorcraft products are sold under a special arrangement with the Texaco oil company on the forecourts of its filling stations.

It is difficult to measure "brand loyalty" in the case of sparking plugs because the ultimate customer does not always make the brand choice. The first two services of new cars at which plugs are changed are usually undertaken under warranty by a dealer authorised by the vehicle manufacturer. This means that the sparking plugs for a Vauxhall will normally come from A.C.Delco, for a Ford from Autolite and for a Leyland or Chrysler car from Champion but there is no certainty about this. After this the degree of loyalty diminishes as the customer can buy any of a number of well-known brands. Much depends upon the outlet he chooses.

Prices vary comparatively little between the well-advertised brands and advertising competition is largely confined to technical journals, point-of-sale advertising and occasional press advertising. Expenditure on advertising by all companies in 1975 amounted to £103,100, which is about 0.5% of the total value of retail sales, excluding tax.

D. The replacement market (Cont'd)

The growth in the proportion of imported cars in use in the U.K. has reduced the predictability of market shares. It has probably increased the potential penetration of the U K market by overseas suppliers of sparking plugs, especially by Bosch of Germany and NGK of Japan. On the other hand, all the domestic producers and the distributors selling "own label" products supply sparking plugs for imported vehicles.

The total size of the replacement market was estimated by the E.I.U. (1) and their estimates correspond closely with our own desk calculations. From 1972 to 1975 these estimates were as follows:-

Table III-6. Sales of Sparking Plugs for Replacement

1972	56.1 million units
1973	58.9 "
1974	57.3 "
1975	57.1 "

Estimates of market share are very difficult to derive. Even direct market surveys are hindered by the fact that many motorists do not know what plugs are fitted to their cars - even if they purchased them from a chain store themselves. Estimates by the EIU (i) do not correspond exactly to those of a manufacturer with whom the problem was discussed. A compromise estimate suggests that in 1975 the shares of the replacement market were as follows:-

Table III-7. Shares of Replacement Sales 1975

Champion	65	(These estimates are only very
Autolite	13	approximate)
A.C.Delco	12	
Bosch	6	
Other imports	4	

E. Financial Statistics

Only the Champion Sparking Plug Co.Ltd. publishes financial data relating to sparking plugs - necessarily because it is a single-product enterprise. In 1975 its sales turnover was £15.72 millions or 64 per cent of total sales of sparking plugs by producers in the U.K. Of the total £4.66 millions was derived from export sales, leaving £11.06 millions as turnover from U.K. sales. This

E. Financial Statistics (Cont'd)

represented about 60 per cent of the total sales revenue derived by U.K. and overseas manufacturers from sales to the U.K. market, slightly lower than its estimated share of the market volume might suggest. This confirms a comment made to us by two people from within the motor industry that Champion is charging lower prices to Leyland and Chrysler for OE and for sale via their dealer networks than corresponding transfer prices of Autolite and A.C. Delco.

Table III-8. Champion's Turnover Record 1968 and 1973-5.

	1968	1973	1974	1975
Total turnover (£m)	7.18	11.55	12.94	15.72
% of U.K. producers	68	73	68	64
Export turnover (£m)	2.06	4.97	4.94	4.66
U.K.Sales (£m)	5.12	6.58	8.00	11.06
U.K. Sales revenue as % of total of all suppliers	n.a.	56	58	60

Sources: Company accounts and Tables III-2 and III-3 above.

Since Champion is a subsidiary of an overseas company it is difficult to interpret its financial performance because much depends upon the principles adopted for transfer pricing and for allocation of indirect expenses.

F. Statistical Summary of Concentration.

Absence of financial data prevents the computation of tables of concentration for this sub-sector. The indices prescribed by the Commission have been applied to the data in Tables III-5 and III-7 with the following results:-

Table III-9. Concentration Indices applied to Market Shares (measured in volume) 1975

	OE	Replacement
Coefficient of variation	0.729	1.138
Gini coefficient	0.388	0.516
Herfindahl-Hirschman	510	459
Entropy index	- 35.8	- 47.7

Linda coefficients (L) and Concentration Ratios (CR)

n* =	L	CR	L	CR
2	1.26	92	2.50	78
3	1.63	100	1.41	90
4	-		1.30	96
5	-		1.24	100
LS	1.45		1.61	

Comments.

For the OE market the Linda index suggests a duopoly: the largest firm had 66 per cent of the market and the second largest 26.2 per cent, leaving the third with 7.8 per cent. Because of exclusive trading by each of the vehicle manufacturers the analysis cannot be used to describe competition in this sector - there is none at present.

In the replacement market the coefficients emphasise the predominance of Champion whose share of the market is nearly five times that of its nearest competitor.

IV. BATTERIES (ACCUMULATORS)

A. INTRODUCTION

In 1968 the Census of Production revealed that there were 16 enterprises employing 25 or more people and producing accumulators for motor vehicle starting, lighting and ignition. By 1976 the number had fallen to 10 partly because of mergers and partly because some companies had withdrawn from this activity. In addition to the firms included in the official statistics there is a larger number of very small enterprises which produce accumulators, sometimes reconditioned, on a small scale.

There are three grades of battery available for purchase by the motorist:-

i) The "first-line" batteries produced also for the original equipment market and designed to specifications laid down by the vehicle manufacturers. These normally carry a two year "guarantee". The retail price of such batteries in 1975 varied (according to outlet and specification) from about £13 to £25. The manufacture of this grade of battery is almost entirely confined to the small group of large companies (now only four in number) who together form the British Battery Makers Society (B.B.M.S.)

ii) Economy or "second-line" batteries also produced by the B.B.M.S. Companies to counter competition from non-members. These batteries are designed for normal use under British driving conditions but do not meet the extremes of use implied by the specification of "first-line" batteries.

Most of these batteries are sold with a one year guarantee. Their retail price in 1975 varied from about £8 to £13.

iii) Low price batteries produced by local manufacturers, sometimes using materials from discarded batteries, which are purchased as scrap. These batteries are distributed under the retailers brand names and varied in price in 1975 from £5 to £10.

B. ANALYSIS OF TOTAL MARKET

Table IV-1 shows the total number of batteries for motor vehicles sold by U.K. manufacturers, the number exported and imported and an estimated breakdown of the total U.K. market into original equipment and replacement.

TABLE IV-1 Volume of Batteries Produced and Traded in 1968-76

(thousands)

		1968	1973	1974	1975	1976
U.K. manufacturers output	(i)	6200	7050	6120	5570	6140
Exports	(ii)	280	390	400	550	540
Imports	(iii)	50	270	250	250	330
U.K. domestic sales (i) - (ii) + (iii)		5970	6930	5970	5270	5930
O.E. Sales		2060	1980	1770	1540	1600
Residual		3910	4950	4200	3730	4330

Source: Business Statistics Office, Overseas Trade Statistics.

Stocking of batteries, sometimes in a dry state for long periods, by intermediaries between the manufacture and the final customer means that the'residual' figure does not exactly represent replacement demand but comparison with other estimates suggests that the approximation is satisfactorily close.

Estimates of original equipment sales have been devised by subtracting from the sum of all vehicles produced in the United Kingdom 60% of the number of cars and goods vehicles exported in assembled form, because the batteries for such vehicles are more usually supplied from within the country of assembly. An allowance has been made for the use of dual batteries in some of the largest goods vehicles.

The value of battery sales by U.K. manufacturers is also published by the Business Statistics Office but it is not possible to divide the total figure into revenue from OE sales and that from the replacement market. Sales revenue figures are contained in Table IV-2 , in which the data are also shown in terms of constant 1976 purchasing power.

TABLE IV-2 VALUE OF MANUFACTURERS SALES OF MOTOR VEHICLE ACCUMULATORS 1968-76

	£m current prices	Index of Value at constant purchasing power
1968	25,591	100.0
1973	39,338	108.3
1974	46,953	111.5
1975	48.181	92.1
1976	62,105	102.5

Source: Census of Production 1968
Business Statistics Office (1973-6)

Note that data refers to establishments with at least 25 employees, except that for 1976 this lower limit was increased to 50. The B.S.O. has stated that the effect on coverage is minimal; it estimates the percentage of total production covered to be about 97 per cent (1).

It is rather difficult to interpret annual changes in sales of batteries because of changes in stock levels of intermediaries- accumulators may be stored in a dry state for long periods.

The number of cars and commercial vehicles in use which were at least two years of age from 11.52 millions in 1973 to 13.3 millions in 1976, so that the number of replacement batteries sold per 100 such vehicles appears on the evidence of Table IV-1 to have fallen from 43 to 33. Since destocking appears to have occurred in 1975, this evidence suggests longer battery life. Among reasons for this may be the (a) use of better materials in battery construction, including the predominance of polypropylene instead of hard rubber cases; (b) the use of better systems of charging and improved performance of alternators; (c) a series of comparatively mild winters with little freezing fog or snow.

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1 Business Monitor PQ.369.2, 1st qtr. 1977 - page 2.

Research into the life of batteries is made difficult by the frequent trading of motor vehicles. A substantial proportion of vehicles-owners did not purchase their present batteries and many of those who did are unlikely to recall the date of purchase.

Although there has been a decline in the market for batteries, supply has become rather inelastic and a possible shortage was mentioned in our discussions with motor company buyers and a major battery manufacturer. Excess capacity exists in the sense that capital is under-utilised but expansion of production might mean extra shifts and recruitment of labour. Uncertainty surrounding the life of batteries and the size of the replacement market may deter producers from taking such steps, which might be difficult to reverse.

C. Foreign Trade

Because of their low value to weight ratio and because of their construction, it is not economic to transport batteries over long distances except where this is justified by unusual specifications combined with economies of scale in production. This explains the comparatively small volume of international trade - export volume amounted to under 9 per cent of U.K. production in 1976 and imports to only 5.6 per cent of batteries sold in this country

The principal destination of exports in 1975 were within Europe, especially the Netherlands, Ireland, Germany and Belguim. Some of these shipments, especially to the Low Countries, are believed to be associated with assembly in the destination countries of vehicles supplied in knocked-down form from the U.K. The same reason accounts for shipments to Iran, the Gulf States and Saudi Arabia, Libya, South Africa and Zaire, which are among the major non-European destinations.

Imports are also mainly from Europe; about half of the total comes from Germany and France. These include purchases by one of the multinational vehicle companies of a small part of its total battery requirements.

D. The Original Equipment Market

Although there are no financial ties between the battery producers and the vehicle manufacturers, a pattern of supply has been established, whereby each of the vehicle companies relies on one or at most two suppliers.

For British Leyland, Lucas Batteries Limited is the dominant supplier. It is part of Lucas Industries Limited with annual sales of over £300 millions of electrical equipment for motor vehicles and aircraft. Until fairly recently Lucas was the sole supplier to the former Austin-Morris division of British Leyland which was the volume-car section of the motor company. Our own enquiries suggest that Lucas continues to supply over 85 per cent of the total battery requirements of Leyland, the rest are obtained from Chloride Limited.

Ford (of Great Britain) bought all its batteries until the early 1970's from Chloride but has now organised its material sourcing on a European basis. Although Chloride remains the dominant supplier (perhaps over 70%), imports from continental suppliers and purchases from Lucas have increased in recent years.

Vauxhall purchases from both Lucas and Chloride but not from any other supplier. A policy of "dual sourcing" means that batteries from both suppliers are fitted to each range of cars.

Chrysler also "dual sources" its battery supplies but Lucas and Chloride account for over 90% of purchases. Occasional purchases have been made from Oldham (see below) and Chrysler has also imported batteries from Canada, from a company then contemplating the establishment of a manufacturing subsidiary in the United Kingdom.

Our analysis of the OE market indicates that in 1975 Lucas and Chloride shared about 94 per cent of this market. Of this Lucas probably accounted for 50 to 54 per cent and Chloride for 40 to 44 per cent, but these are only tentative estimates based on discussions within the motor industry

Although sales of batteries for original equipment yield less profit than those to the replacement sector, the competitive pressure on prices in the latter sector and the virtual duopoly in OE sales mean that the price differential is smaller than in other European countries. We understand that in Germany prices of batteries for original equipment are much lower than the corresponding prices in the U.K. and are less than U.K. standard costs of manufacture. Marginal-cost pricing of OE sales in Germany is possible because retail prices for replacement are over three times the average U.K. level.

It is not clear why the traditional ties between Lucas and Leyland and between Chloride and Ford should continue. The motor manufacturers face greater risks of interruption of supplies and the battery makers are more vulnerable to changes in policy on the part of the vehicle manufacturers. The persistence of the arrangements seems to be part of a détente in competition between Lucas and Chloride.

E. Replacement Sales

1. The Companies Supplying this Sector

The major suppliers to the replacement market are:

Chloride Group Ltd.	(Total European sales of automotive products mainly batteries, in year ended 31st March, 1976 were £56 m.)
Carlton Industries Ltd.	(via its subsidiaries Oldham International Limited, acquired in 1972, and Tungstone Batteries Ltd., taken over in 1973: total sales of batteries in 1975 were around £20 millions.)
Lucas Industries Ltd.	(via the subsidiary Lucas Batteries Ltd., for which no sales turnover figures are published and estimation is impossible.)
Hawker Siddley Ltd.	(via its subsidiary Crompton-Parkinson Ltd., which does not publish separate figures for automotive battery sales.)

These four companies supply most of the premium batteries sold in the United Kingdom and also provide economy ranges. Together they form the British Battery Makers Society, which acts as a protective organisation but is prevented by the 1956 Restrictive Trade Practices Act from price fixing. The B.B.M.S. did not co-operate in this investigation, though one of the four member companies discussed with us, in broad terms, recent developments in this industry.

As well as these four companies, there are six other manufacturers with 50 or more employees (identified from B.S.O. information) and a large number of small firms. Most of these firms supply batteries for sale under the brand names of wholesalers or retailers and, since these brands are also supplied by the big four, it is difficult to measure their importance in the market.

2. Brands, consumer loyalty and advertising

The six major manufacturers' brands sold on the retail market are as follows:-

Chloride	:	Dagenite and Exide
Lucas	:	Lucas and Toplife
Carlton Industries	:	Oldham and Tungstone
Crompton	:	Own name.

Most of the batteries are sold under the brand name of the distributor. Among the most important are Blue Star sold at the premises of Blue Star garage chain; Esso (Voltpak) and the batteries sold by the specialist fitting stations, whose main product is tyres - ATS (Associated Tyre Services, a subsidiary of Michelin) and NTS (National Tyre Services - a subsidiary of Dunlop) are the most significant of these brands.

Two of the vehicle manufacturers have acted as factors for batteries as part of their "all-makes" wholesaling activities. British Leyland experimented with the sale of Lucas batteries under their Unipart scheme

but this practice has now been modified. Because of production problems for Lucas caused by dual labelling, Lucas batteries are now distributed by British Leyland via its accredited dealers under the Lucas name. Chrysler now sells second-line batteries from Chloride and Lucas as part of its Mopart range. Vauxhall is not involved in the wholesaling of batteries and Ford supplies only a limited range of mainly Chloride batteries for Ford cars, under the Ford name.

Imported batteries represented only a small proportion of the replacement market, foreign trade statistics suggests that this was less than 5 per cent. Although some foreign companies supply the British market (e.g. Bosch and Varta from Germany), some of the batteries concerned are produced on a sub-contract basis within the U.K. (by Chloride and Lucas respectively in the case of two firms).

A car battery is not a "concern" product - it does not affect the safety of a car: nor is it an "image" product. Only under extreme conditions is it likely to fail without warning and that failure is most probable in the early morning in the privacy of the motorist's garage. It is a fairly expensive item - a premium battery can cost over £20; it is an item on which many motorists are prepared to economise. Brand loyalty is low and the market is open to local producers of lower quality batteries who, with minimal overheads, are able to supply at a low price.

The main channels of distribution for batteries are:-

a) Wholesalers and "factors" who supply "traditional"garages and vehicle service stations with manufacturers' brands. Some of these wholesalers are agents for individual manufacturers. For example, Lucas has about 350 franchised agents for its automotive electrical products, out of which 140 are owned by the manufacturer. Chloride also has outlets which are either owned or controlled through exclusive dealing arrangements. The EIU (1) estimated that about 60 per cent of batteries were sold via vehicle repairers

who acquired them from independent or manufacturer-owned wholesalers. Chloride appears to be the leading company in sales via this channel of distribution.

b) Specialist fitting stations, many of whom buy straight from manufacturers, and sell under their own brand names. Blue Star Garages, ATS and NTS can be included in this category. The economies gained by elimination of intermediaries are at least partly passed on to the customer in lower prices. This channel of distribution has gained importance in the last few years and the EIU estimated that in 1975 25 per cent of batteries were sold by this route.

c) Sales via retail shops have also increased in recent years. Some battery producers (e.g. Lucas) have financial interest in retailing but most retail chains obtain batteries from a variety of sources.

This is a market for a "low-interest" product with a variety of channels of distribution and a very large number of brand-names, many of which cannot be directly linked with particular manufacturers. Advertising is much less significant in relation to sales than is the case in the distribution of tyres. Advertising has also been widely erratic. The MEAL data shows, for example, that Chloride spent £252,000 on advertising in 1976 compared with only £1,100 in 1975. Total advertising has varied as follows over the years since 1968:-

TABLE IV-3

PRESS & TELEVISION

ADVERTISING EXPENDITURE ON MOTOR VEHICLE ACCUMULATORS 1968-76

	Actual total (£000)	% of total battery sales	Index at constant purchasing power
1968	265.0	1.0	100
1969	150.3	n.a.	54
1970	396.4	n.a.	134
1971	309.5	n.a.	95
1972	224.8	n.a.	65
1973	113.2	0.3	30
1974	54.9	0.1	13
1975	20.1	0.0	4
1976	276.5	0.4	44

Source: MEAL and B.S.O.

One of the interesting features of advertising expenditure has been the high proportion of the total accounted for by distributors of brands other than those of the four BBMS members. These include firms selling cut-price batteries whose main objective in advertising has been to draw attention to their prices (e.g. Blue Star).

TABLE IV-4 TOTAL ADVERTISING EXPENDITURE BY COMPANIES 1968-76 (£000's)

	1968-72	1973-6	
Chloride	531.5	348.0	(252m in 1976)
Lucas	175.4	1.6	
Crompton	37.7	4.5	
Oldham	63.0	nil	
Tungstone	115.3	1.1	
Blue Star	193.3	58.4	
Other	229.8	51.1	
TOTAL	1346.0	464.7	

3. Market Shares

It is difficult to determine the sources of some of the batteries sold under the brand-names of non-manufacturers. This means that any estimates of manufacturers' shares of the replacement market can be only approximate. Such estimates are shown in Table IV-5. They are based on the results of the EIU survey (1) but have been slightly modified on the basis of our own discussions.

C CONCENTRATION RATIOS

Two of the major suppliers (Lucas and Crompton-Parkinson) do not release any information relating to their sales of batteries. Other companies publish figures which also include sales of other products and the activities of overseas subsidiaries.

It has proved impossible to derive any financial data and the only variables for which concentration indices can be calculated are the estimated shares of volume, in the OE and replacement sectors separately and combined.

TABLE IV-5 ESTIMATES OF MARKET SHARE 1975 (%)

	OE	Replacement	Combined
Chloride	42	35	37
Lucas	52	17	27
Haddon-Oldham	1	13	10
Crompton	0	10	7
Others	5	25	19

The results of the computations are shown in Table IV-6.

TABLE IV-6 CONCENTRATION INDICES - VOLUME OF SALES OF ACCUMULATORS
(ESTIMATES FOR 1975)

	Original Equipment	Replacement	Combined
Coefficient of Variation (V)	1.30	1.83	2.11
Gini coefficient	0.63	0.65	0.70
Herfindahl-Hirschman index (H)	448	182	226
Entropy index (E)	-41.4	-97.6	-87.7

Concentration ratios and Linda indices

N* =	CR	L	CR	L	CR	L
2	94	0.619	52	1.029	64	0.685
3	96	4.311	65	0.722	74	0.867
4	98	3.574	75	0.588	81	0.818
5	99	3.923	77	0.972	82	1.752
	LS = 0.619		LS = 0.780		LS = 0.685	

In calculating these coefficients, we assumed that the maximum number of "other" suppliers to the OE market was three. The corresponding number for the replacement and combined analyses was 20. These assumptions do not affect the concentration ratios and Linda indices shown in the table but are reflected in the other coefficients. The variations in V, G, H, and E, are interesting to compare. The increase in the number of companies of very small size causes H and E to fall, because these coefficients are sensitive to the number of firms in the market, which indicates less concentration. The dispersion of company size has increased and, since G is related to dispersion, this index rises, indicating greater concentration.[1]

The Linda indices confirm that the total supply of batteries is dominated by two firms (Lucas and Chloride) but in the replacement market an oligopoly includes the four members of the British Battery Makers Society.

[1] For a fuller treatment of the mathematical properties of the indices see "A Study of the Evolution of Concentration in the U.K. Paper Industry", the first 'Cranfield' report in this series.

Appendix A Definitions and Basic Properties of Concentration Indices

In this explanation of the main indices specified by the Commission and used in this analysis the following notation is used:

N total number of firms in the industry;

x_i the value of a variable for Firm i, when firms are ranked in descending order with respect to that variable;

X the aggregate of the variable for the whole industry, that is,

$$\sum_{i=1}^{N} x_i$$

P_i the proportion of the aggregate accounted for by Firm i, that is,

$$\frac{x_i}{X}$$

μ the arithmetic mean value of the variable, that is, $\frac{X}{N}$

(a) Concentration Ratio

The concentration ratio for R firms within an industry is the fraction of the total value of the variable accounted for by the R largest firms ranked in descending order of that variable:-

$$\underset{(\%)}{CR} = \frac{100}{X} \sum_{i=1}^{R} x_i$$

Concentration ratios give only limited information about the structure of an industry. With different distributions of the variable, comparison of degrees of concentration between different sectors may depend on the number of firms chosen. In industry A the top five firms may account for 40 per cent of sales and the next five 30 per cent (giving a ten-firm CR of 70 per cent). In industry B the five largest firms may account for 50 per cent of sales and the next five 18 per cent (giving a ten-firm CR of 68 per cent).

(b) Coefficient of Variation

This is the standard deviation of the distribution of values of the variable as a proportion of the mean

$$V = \frac{1}{\mu}\sqrt{\frac{\Sigma(X_i-\mu)^2}{N-1}}$$

(c) The Gini Coefficient

This measure is based on the Lorenz curve. The Lorenz curve plots the percentage of total industry turnover on the vertical axis against percentage of firms cumulated from the smallest on the horizontal axis. Thus the curve is concave (degenerating into a straight line when all firms are of equal size). Where a variable other than turnover is used, the percentage of firms is cumulated from the firm with the smallest value of the variable under consideration.

The Gini Coefficient is defined (see Fig. 1) as:

$$\frac{\textit{Shaded Area}}{\textit{Area OXY}}$$

It ranges from 0 (all firms equal in size) to 1 (all output in the hands of a single firm). The following formula provides a method of calculation when the values of the variable are ranked in ascending order
(x_j; j+1 to N)

$$\frac{1}{NX} \sum_{j=1}^{N} (j-1)F_j - jF_{j-1}$$

$$F_j = \sum_{k=N-j+1}^{N} x_k$$

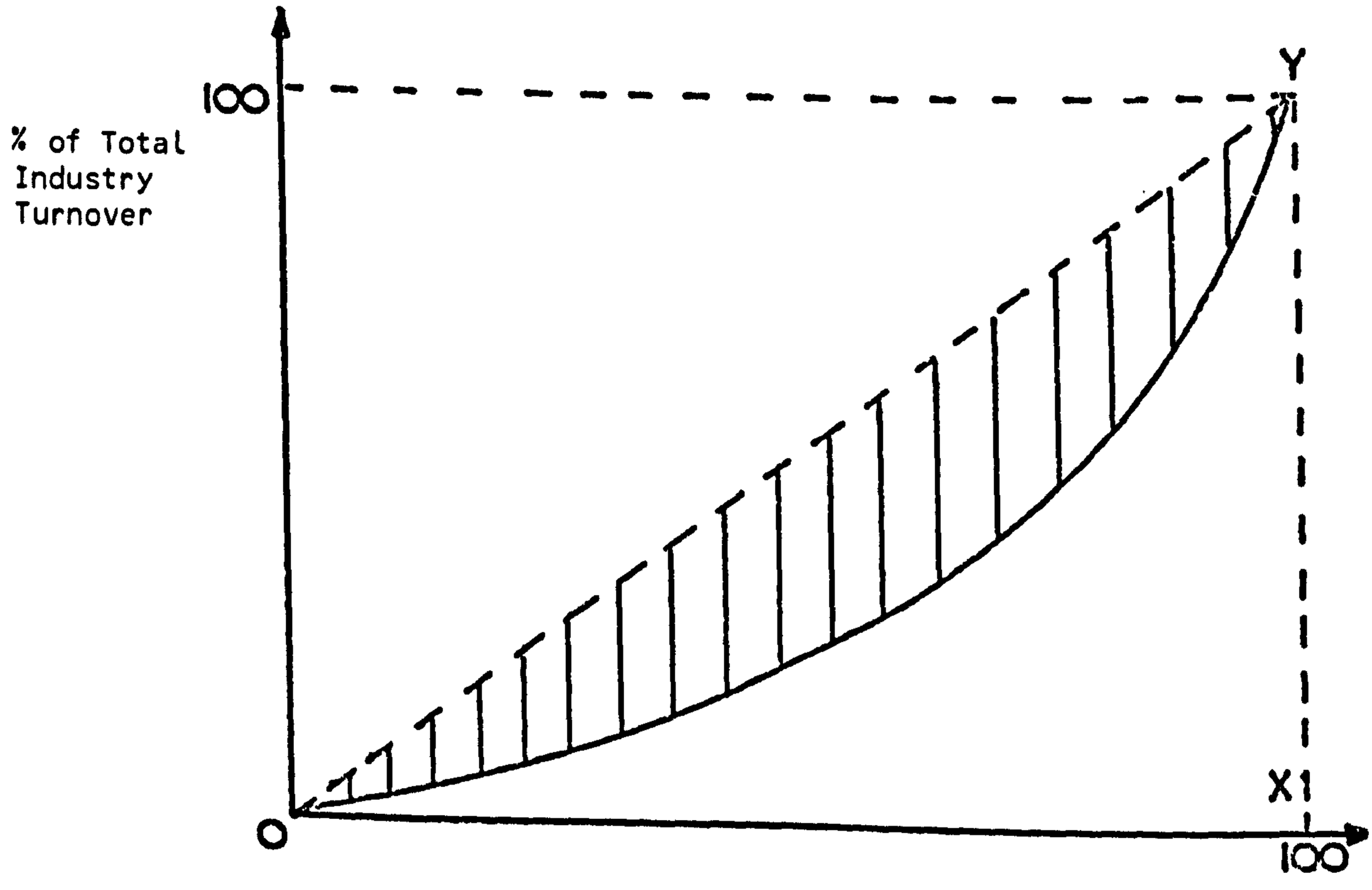

Fig. 1

(d) Herfindahl-Hirschmann Index

This was suggested by Herfindahl and is defined as the sum of the squares of the market shares, i.e.

$$\text{Herfindahl-Hirschmann Index} = \sum_{i=1}^{N} p_i^2$$

The index lies between $\frac{1}{N}$ and 1. Some authors prefer to define it as:

$$\text{H-H} = 1000 \sum_{i=1}^{N} p_i^2$$

i.e. to inflate its value by a multiple of 1000. This convention has been adopted by the Commission and is followed in this report.

The index is related to the coefficient of variation and in other publications by the Commission in this series has been defined accordingly:-

$$\text{H-H} = \frac{1000(V^2 + 1)}{N}$$

(e) Entropy

This is defined as:-

$$\text{Entropy Index, E} = - \sum_{i=1}^{N} p_i \log p_i$$

If one share is 1 and all others are 0, then $E=0$ and the degree of concentration is maximum. If all shares are equal $(=\frac{1}{N})$ then $E = - \log N$ and the degree of concentration is minimum for that value of N.

The entropy index, explained at some length in the Cranfield report on the paper industry, has the advantage over other measures of concentration that absolute changes in its value may be compared. For example if the Gini coefficient moves from 0.3 to 0.5 in one industry and from 0.7 to 0.9 in another, it cannot be concluded that concentration has increased to the same degree. With the entropy index, such a conclusion could be drawn. (10)

(f) Linda Index

Another measure of industrial concentration is given by Linda.

$$Q_i = \frac{K - i}{i} \cdot \frac{A_i}{1 - A_i}$$

where $A_i = \frac{1}{X} \cdot \sum_{j=1}^{i} x_j$ and values of x are in descending order.

K may be any number of firms from 2 to N. (Thus Q_i is the average share of the market held by the top i firms divided by the average share of the market held by the other $(K-i)$ firms included in the sample).

The Linda Index is defined as:

$$\frac{1}{K(K-1)} = \sum_{1}^{K-1} Q_i$$

(i.e. the Linda Index is $\frac{1}{K}$ x the average of the Q_is).

The Linda index is designed to measure the degree of inequality between the values of the variable included in a sub-sample of K units.

The Linda Index may also be used to define the boundary between oligopolists within an industry and the other firms. The boundary occurs when the value of $\frac{x_k}{x_{k+1}}$ is so large in relation to previous ratios that, in spite of

averaging, the Linda index rises. If the value of the Linda index (L) is greater for $(k+1)$ than for (k) then an "oligopolistic arena" of k firms may be identified.

Mathematically this critical point (k_m) may be defined as where

$$\frac{dL}{dk} = 0 \quad and \quad \frac{d^2L}{dk^2} > 0$$

A measure of "synthesis" (LS) is inclueded in the Tables of Concentration. This represents the mean value of the Linda indices from $k=2$ to $k=k_m$. LS is used in further statistical development of the analysis of concentration now being undertaken by the Commission.

The definition of k_m (N^*_m in the Tables of Concentration) on this basis differs from that used in earlier reports published by the Commission. This re-definition follows further analysis of the concepts underlying the Linda approach.

Appendix B Profile of Major Companies in the Three Sub-Sectors

This analysis is confined to United Kingdom companies and includes the following:-

Tyres: Dunlop Holdings Ltd.
Avon Rubber Co. Ltd.

Batteries: Lucas Industries Ltd.
Chloride Ltd.

The four other major suppliers of tyres are overseas-based (Firestone, Goodyear and Uniroyal in the U.S.A; Michelin in France). Analysis of financial data relating to world-wide activities has been included in Section II (pages 54 and 72). All the producers of sparking plugs are subsidiaries of U.S. parent companies.

DUNLOP HOLDINGS LTD.

Dunlop is one of the longest established rubber tyre producers in the world. In Section II we described how its share of the U.K. market tended to decline during the period 1969-75, although when the associated Pirelli activities are included, it remained the largest firm in both the OE and replacement markets.

The establishment of the Dunlop-Pirelli union in 1971 was a fairly complex arrangement:

Dunlop Ltd. (tyres and other products in the U.K. and Europe): 51% of equity held by Dunlop Holdings Ltd., 49% by Pirelli S.p.A.

Dunlop International Ltd. and other Dunlop companies operating outside Europe: 60% of equity held by Dunlop Holdings Ltd., 40% by Pirelli S.p.A.

Pirelli Ltd.(U.K.): 51% of equity owned by Dunlop Holdings Ltd. and 49% by Pirelli S.p.A.

Industrie Pirelli S.p.A.(Italy): On the formation of the Union in 1971 Dunlop Holdings acquired 49% of the equity of this company, compared with the holding by Pirelli S.p.A. of 51%. In 1972 Dunlop Holdings wrote down its holding in this company by transfer from retained earnings so that Dunlop shareholders are no longer responsible for any losses incurred and the Dunlop Holdings accounts no longer include a proportion of profits or losses attributable to Industrie Pirelli. Additional capital for Industrie Pirelli, to be subscribed by Pirelli S.p.A., will reduce the Dunlop Holdings share of equity to 30%.

Other Pirelli activities (outside the U.K. and Italy)
Dunlop Holdings equity share varies from 13 to 49 per cent and in most of the larger companies is 40 per cent or over.

Certain Dunlop subsidiaries, in India and Rhodesia, are excluded from the Dunlop-Pirelli Union.

Table B1 shows an analysis of sales of Dunlop Holdings Ltd. over the years 1971-5.

Table B1. Dunlop Holdings Ltd. Analysis of Sales Revenue by Product and Geographical Area of Operations - (£m)

	1971	1972	1973	1974	1975
By product					
Tyres	368	401	463	528	615
Industrial products	68	71	84	114	133
Consumer products	101	116	142	170	188
Engineering products	40	38	45	52	57
Supply group	8	10	16	24	22
	585	636	750	888	1015
By geographical area					
U.K.	252	259	286	345	393
Rest of Europe	137	154	188	233	265
N. & S. America	79	93	109	103	119
Africa	49	53	70	78	105
Asia & Australasia	68	77	97	129	133
Total sales revenue	585	636	750	888	1015

Tyres almost maintained their relative importance as a source of sales revenue for Dunlop (63 per cent of the total in 1971; 62 per cent in 1973; and 61 per cent in 1975). The United Kingdom accounted for 43 per cent of sales in 1971 and 39 per cent in 1975; sales in the American continents also declined relatively to those in Africa, Asia/Australasia and continental Europe.
Among Dunlop's consumer products, which contributed much to the growth of sales are foam products (bedding etc.), sports equipment and footwear.

Industrial products include textiles, wheels and vehicle suspensions and hosing.

Table B2 shows the sources of after-tax profits of Dunlop Holdings Ltd. and also relates these to equity capital.

Table B2. Dunlop Holdings Ltd. - Analysis of Profits by Product and Geographical Area (£m)

	1971	1972	1973	1974	1975
Profit before interest and tax (a) by product group					
Tyres	30.8	30.0	29.9	29.6	38
Industrial products	3.4	4.5	7.3	12.2	12
Consumer products	5.7	6.8	7.9	8.7	8
Engineering products	2.8	2.6	1.9	4.7	4
Supply group	1.4	0.7	2.3	4.8	3
Total	44.1	44.6	49.3	60.0	65
(b) by geographical area					
U.K.	10.8	12.9	11.7	21.7	21
Rest of Europe	11.4	8.6	7.0	5.5	7
N.&S. America	7.9	10.0	9.6	7.0	9
Africa	6.0	6.5	9.7	10.5	13
Asia and Australasia	8.0	6.6	11.3	15.3	15
Total	44.1	44.6	49.3	60.0	65.1
Add Income from minority holdings etc.	6.9	8.8	6.2	10.0	11.0
Deduct Interest	12.9	13.5	19.8	26.0	24.1
Net profit before tax	38.1	39.9	35.7	44.0	52.0
Deduct Taxation	18.3	18.3	19.6	24.4	28.5
Net profit after tax	19.7	21.6	16.1	19.6	23.5
Deduct Minority shareholders interests	8.1	8.2	6.3	9.5	8.5
Profit attributable to shareholders of Dunlop Holdings Ltd.	11.6	13.4	9.8	10.1	15.0
Previous line as % of shareholders' funds.	7.1	9.7	6.2	5.5	7.3

From Tables B1 and B2 are calculated the ratio of profits before interest and tax to total sales for each of Dunlop's product groups. These ratios are shown in Table B3.

Table B3. Dunlop Holdings Ltd. - Profit Margins by Product Group
Profits before interest and tax as % of sales turnover

	1971	1972	1973	1974	1975
Tyres	8.4	13.4	6.5	5.6	6.2
Other products	6.1	6.2	6.8	8.4	6.8
Total	7.5	7.0	6.6	6.8	6.4

Table B3 shows that other products became more profitable than tyres (Dunlop's major product) from 1973 onwards. The decline in profitability of the divisions other than tyres in 1975 may be explained by the trade recession; the partial recovery in the profitability of tyre manufacture may be explained by price increases. Although the profit margin per £ of sales of tyres increased in 1975 it is important to point out that in terms of constant purchasing power, tyre sales fell by 6 per cent between 1974 and 1975 and total profits from tyre sales remained almost unchanged.

AVON RUBBER COMPANY LTD.

Unlike Dunlop, Avon is primarily engaged in the U.K. market. As well as manufacturing tyres, Avon owns two distribution companies, Motorway Tyres and Accessories Ltd. and Motorway Tyres and Accessories (Scotland) Ltd. As well as Avon tyres and those sold under the brand name of another subsidiary Henley's Tyre and Rubber Co. Ltd., Motorway Tyres distributes tyres from outside suppliers. It also distributes batteries and other specialist products.

To facilitate comparison with Dunlop, whose accounts are presented in this way, we have combined the figures for tyre production and distribution in the following analysis of Avon's turnover and profits:-

Table B4. Avon Rubber Co. Ltd. - Analysis of Sales by Product and by Geographical Area (£m)

Products	1969	1971	1973	1974	1975	1976
U.K. Tyres	22.6	28.4	33.4	41.0	45.9	54.2
Other U.K. products	10.7	12.2	13.9	15.9	16.9	21.8
Overseas	3.2	5.8	6.0	7.3	9.1	11.8
	36.5	46.4	53.3	64.2	71.9	87.8

Overseas activities are concerned mainly with tyres. In 1969 total tyre-related sales turnover (i.e. tyre manufacture and distribution in the U.K. and overseas - a total of £25.8m) accounted for 71% of total company turnover; by 1976 the proportion had risen to 75%.

Besides tyres, the company's U.K. activities include the manufacture of rubber hoses and extrusions, sold mainly to the motor industry, and manufacture of domestic washing machines, dishwashers etc; a wide range of other products made from extruded rubber or polymers (from golf grips to diving suits and skirts for hovercraft); specialist medical components and inflatable dinghies.

The company's attempts to diversify activities during the past few years have been reflected in substantial increases in fixed assets but, because of the unfavourable economic conditions, the company's profits tended to fall until 1975. In 1976 there was a recovery:-

Table B5. Avon Rubber Co. Ltd. - Analysis of Profits
Analysis of net profit before tax (£000's)

Products	1969	1971	1973	1974	1975	1976
U.K. tyres	-247	2106	937	688	-780	285
Other U.K.	516	326	964	944	752	1734
Overseas	111	-142	255	250	57	412
Investment income	108	18	79	61	474	22
Total	449	2308	2235	1943	-503	2453
Less tax	116	840	996	1019	-144	1457
Net profit after tax	333	1468	1239	924	-359	996
Less minority interests	6	8	13	-4	21	55
Net profit attributable to equity holders.	327	1460	1226	928	-380	941
% of equity	2.5	11.1	8.6	6.8	-3.0	6.9

Table B5 shows that the decline in Avon's profits was concentrated in tyre production and distribution. The detailed analysis in the company's accounts shows that this occurred mainly in the production of remould tyres and in the development of the Avon safety wheel (which is included by the company in its tyre operations). These are activities into which new capital was injected in the early 1970's with a consequently high depreciation charge.

Because of the low profits and the need to finance fixed and working capital, the company's reserves fell from £9.15 millions in 1971 to £6.22 millions in 1975 but there was a rise to £7.03 millions in 1976. The equity capital of the company at the end of 1976 was £13.7 millions, compared with £13.1 millions in 1969.

LUCAS INDUSTRIES LTD.

Lucas Industries Ltd. (formerly Joseph Lucas Industries) is one of a small number of large companies in the United Kingdom which produce components for the motor industry but do not themselves manufacture vehicles (except experimental construction). The 1976 turnover of the company was £719 millions and the company employed nearly 64,000 people in the U.K. and another 14,700 were employed by overseas subsidiaries.

The Company does not publish a breakdown of its turnover in sufficient detail for identification of its battery-manufacturing activities. The following table (B6) is an analysis of sales turnover over the years 1970-76.

Table B6. Analysis of Sales Turnover - Lucas Industries Ltd.(£millions)

	Vehicle equipment	Other products	Total	Index of total at constant p.p.
1970	221	63	284	100
1971	245	75	320	103
1972	260	80	340	102
1973	308	91	399	110
1974	356	97	453	107
1975	456	114	570	109
1976	580	139	719	120

The last column of Table B6 shows that the growth of Lucas sales turnover receded only slightly in 1974 and 1975, and that a substantial expansion occurred in 1976 especially in the vehicle equipment section.

Lucas has also achieved a record of high profits over the survey period, as shown in Table B7 which contains certain financial ratios.

Table B7. Financial performance of Lucas Industries

	Net profits before interest and tax		Net profits after tax attributable to equity as % of equity
	% of net assets	% of sales	
1970	9.8	3.9	not comparable
1971	9.7	5.5	23.2
1972	11.4	7.4	30.6
1973	12.8	10.1	37.7
1974	8.9	4.7	20.9
1975	13.5	6.3	35.0
1976	17.2	7.3	55.8

The total value of reserves attributable to Lucas shareholders rose from £48.7 millions at the end of 1970 to £171.5 millions at the end of 1976 which, after adjustment for inflation, represents a growth of 66.6 per cent.

How far the very strong financial position of Lucas can be explained by its near-monopoly position in the supply of certain vehicle equipment (especially electrical components) cannot be determined, because no detailed breakdown of product profitability is published.

THE CHLORIDE GROUP LTD.

This company is believed to be the largest producer of rechargeable batteries in the world.[1] The company's European activities are split into four divisions:-

Automative which includes lead acid accumulators, all the company's dry batteries and the wholesaling of electrical products for motor vehicles.

Industrial which covers batteries for motive power and standby power.

Systems which includes standby power and portable lighting systems and security systems.

Plastics and Metals which includes lead recovery and refining, battery containers and plastic mouldings but also a number of diverse products - sanitary ware, bathroom fittings and precision engineering.

Overseas operations cover the manufacture of batteries for all purposes, including automotive.

Table B8 on the next page shows a breakdown of sales turnover and of profits over the four years 1972/3 to 1975/6 (to 31 March in the second year). Financial data for earlier years were analysed differently by the company.

The sales figures show a growth of 61 per cent in the real value of sales turnover between 1972/3 and 1974/5 with a slight recession in 1975/6, probably resulting from the trade recession in the world as a whole. The principal growth has occurred in Europe in products other than those linked with the motor-vehicle industry, that is batteries other than vehicle accumulators. The company's U.K. operations have grown less quickly than those overseas, and their contribution to group profits has declined.

The profit margin on European automotive sales was consistently lower than the average for other sales. One reason for the unusually low profit/sales ratio in 1974/5 was the degree of excess capacity resulting from the depressed market for motor-vehicle accumulators. The 1975/6 and 1976/7 figures appear to confirm that the profit margin on sales is very sensitive to capacity utilisation - sales of batteries recovered substantially in 1976.

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[1] EXTEL report on the company.

Table B8. Chloride Group Ltd. - Analysis of Sales and Profits by product and Geographical Area

(a) SALES (£m)	Year Ended 31 March 1973	1974	1975	1976
Europe: Automotive	29.7	34.7	47.8	56.0
Other	30.0	38.1	103.7	98.6
Non-European activities	29.4	52.1	72.8	60.6
Less intra-company sales etc.			-42.3	
Total sales turnover	89.1	124.9	182.0	215.2
Index at constant purch. power	100	128	161	154
U.K. companies as % of total	n.a.	50.0	49.4	44.9
(b) PROFITS (£000)				
Profits before interest and tax				
Europe: Automotive	1680	1630	1341	3325
Other	6727	7103	9616	6744
Non-European activities	3890	6680	8896	11344
Income from assocd. cos.	nil	353	897	1401
Total	12297	15766	20750	22814
Less Interest	849	2101	4523	3882
Net profit before tax	11448	13665	16227	18932
Less tax	4217	6520	7267	8659
Net profit after tax	7231	7145	8960	10273
Less minority interests	351	593	466	474
Profit after tax attributable to Chloride shareholders (A)	7970	6552	8494	9799
(A) as % of equity	19.9	14.8	15.0	14.7
% of (A) attributable to U.K. activities	n.a.	56.6	49.5	41.6

Table B9. Chloride Group Ltd. - Profits before interest and tax as percentage of sales

Financial Year	Automotive products in Europe	All other company activities
1972-3	5.65	17.9
1973-4	4.70	15.3
1974-5	2.81	13.8
1975-6	5.94	11.4
1976-7	5.40	13.3

Source: Company accounts.

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COMMISSION OF THE EUROPEAN COMMUNITIES

A STUDY OF THE EVOLUTION OF CONCENTRATION IN THE PRESS AND GENERAL PUBLISHING INDUSTRY IN THE UNITED KINGDOM

by F. Fishwick
Cranfield School of Management

Manuscript finished in October 1977

P R E F A C E

The present volume is part of a series of sectoral studies on the evolution of concentration in the member states of the European Community.

These reports were compiled by the different national Institutes and experts, engaged by the Commission to effect the study programme in question.

Regarding the specific and general interest of these reports and the responsibility taken by the Commission with regard to the European Parliament, they are published wholly in the original version.

The Commission refrains from commenting, only stating that the responsibility for the data and opinions appearing in the reports, rests solely with the Institute or the expert who is the author.

Óther reports on the sectoral programme will be published by the Commission as soon as they are received.

The Commission will also publish a series of documents and tables of syntheses, allowing for international comparisons on the evolution of concentration in the different member states of the Community.

ACKNOWLEDGEMENTS

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The author also wishes to thank those people who worked with him on the project, most of whom are now no longer at the School. Much of the basic data collection and initial computation was undertaken by Elaine Battison and John May; Deborah Moller managed much of the schools survey and Dulce Soares-Marques did much of the computer work in the final stages of that part of the study. Their help is greatly appreciated.

CONTENTS

	Page
Introduction	9
SECTION I - THE PUBLISHING INDUSTRY AS A WHOLE	11
Definitions	11
A. ANALYSIS OF SALES AND PRODUCTION OF PUBLISHED MATTER	
1. Statistical Analysis	11
2. Overseas trade in published matter	13
3. Further analysis of sales of books	15
B. CONCENTRATION IN PUBLISHING AS A WHOLE	15
Methodology	15
1. Trends in sales revenue and profits (Econ. Acitivity Units)	17
2. Some general comments regarding concentration	18
3. Standard concentration ratios and their interpretation	19
4. Analysis of other financial variables	22
Tables of Concentration for Enterprise Data and Matrices of Oligopolistic Interdependence	26
SECTION II - CONCENTRATION IN THE NEWSPAPER AND PERIODICALS INDUSTRY	55
Definitions	55
A. GENERAL SURVEY OF TRENDS IN THE U.K. PRESS	55
1. Total revenue	55
2. More detailed analysis of advertising	56
3. Trends in circulation	58
B. MORE DETAILED ANALYSIS OF NEWSPAPERS BY CATEGORY	61
1. National Dailies	61
2. National Sundays	63
3. Regional (or provincial dailies)	64
4. Regional Sundays	66
5. Local weeklies	66
C. THE DISTRIBUTION OF NEWSPAPERS AND PERIODICALS	66
1. Distribution of national newspapers and periodicals	66
2. Distribution of provincial newspapers	67
3. Newspaper retailers	68
4. Distribution margins	69
D. THE STRUCTURE OF THE NEWSPAPER PUBLISHING INDUSTRY	69
1. Selection of sample	69
2. Approach to analysis of concentration	70
3. Links between companies in the sample and interests in small press companies	74

	Page
4. Competitive media and investment in them by the Press	75
E. ANALYSIS OF NATIONAL CONCENTRATION	79
1. Analysis of Turnover and Profits	79
2. Analysis of Circulation (copies sold)	83
F. REGIONAL MARKETS	86
G. ANTI-MONOPOLY LEGISLATION & LOCAL NEWSPAPERS	91
H. CONCENTRATION OF PERIODICAL SALES	92
SECTION III - SURVEY OF CONCENTRATION IN PUBLISHING OF SCHOOL TEXTBOOKS	94
A. INTRODUCTION	94
B. DESCRIPTION OF SURVEY	94
C. STATISTICAL SIGNIFICANCE	97
D. ANALYSIS OF RESULTS - TOTAL MARKET	98
E. ANALYSIS OF RESULTS BY SUBJECT	100
APPENDIX A. DEFINITIONS & BASIC PROPERTIES OF CONCENTRATION INDICES	103
APPENDIX B. HOLDINGS BY NEWSPAPER COMPANIES IN COMMERCIAL TELEVISION AND RADIO. 30TH JUNE 1975.	108
1. Television	108
2. Radio	109
APPENDIX C. MAP SHOWING PRESS REGIONS	111
APPENDIX D. PROFILES OF MAJOR COMPANIES	112
1. Reed International	112
2. The Thomson Organisation	113
3. S. Pearson & Son Limited	114

LIST OF CONCENTRATION TABLES

Sales turnover profits :	1968-1975 EAU publishing pp. 19-21	EAU Press 1968, 1973 & 1975 p. 81
All of variables 01-08 + Net cahs flow Net assets :	Enterprises with matrices pp. 26-54 1968-1975	
Retail value of sales t/o (market share) :	1975 periodicals p. 93	1976-77 School texts p. 100
Circulation (copies sold) :	(Press nationally) 1968 & 1975 p. 85	Six regions of U.K.1975 p. 88
Circulation (titles) :	Six regions 1968, 1970, 1972, 1975	

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INTRODUCTION

The terms of reference from the Commission of the European Communities define three topics for investigation: the evolution of concentration in publishing as a whole, a more detailed study of concentration in the publishing of newspapers and periodicals and another detailed study of the sale of books in schools. This report is divided into sections corresponding with these three topics. Section I includes an examination of trends in the publishing industry and an analysis of concentration of sales turnover and of all the other financial variables specified by the Commission.[1] Section II contains a similar analysis of trends in the publishing of newspapers and periodicals (described more briefly as the Press). Section III is a report of a survey of stocks and purchases of textbooks in British schools in the academic year; the objective of this survey was to identify the degree of specialisation by publishers in particular subject areas.

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[1] The details of the methodology prescribed by the Commission are set out in R. Linda: "Methodology of Concentration Analysis applied to the Study of Industries and Markets" (Commission of the Eur.Comms., Sept.1976).

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SECTION I - THE PUBLISHING INDUSTRY AS A WHOLE

Definition of Publishing

This study covers two industries as defined by the Business Statistics Office of the United Kingdom[1]:-

Minimum List Headings 485 and 486: printing and publishing of national daily and Sunday newspapers, local newspapers published at least once per week and periodicals issued regularly at intervals exceeding 24 hours.

Minimum List Heading 489 (part): publishing of books, maps, music, religious tracts, almanacs etc.

As far as possible, printing activities not directly associated with the publication of these products have been excluded. These excluded activities are job and contract printing, production of banknotes, stamps, tickets, playing cards and similar printed matter. Where these activities are undertaken on the same premises as the production of published matter (e.g. job printing by a newspaper company) it has not always been possible to exclude them but any distortion is believed to be small.

A. ANALYSIS OF SALES AND PRODUCTION OF PUBLISHED MATTER

1. Statistical Analysis

Table I-1 Analysis of Publishing Sales in Recent Years

Value of sales (£ millions) at current prices.

	Copy Sales	Press Advertising	Books	Other	Total
1968	227	255	127	31	640
1970	272	320	161	42	795
1973	362	496	222	73	1153
1974	430	521	272	78	1301
1975	531	548	332	98	1509
1976	613	652	391	119	1775

Sources: Census of Production 1968 and 1973
Business Monitor 1970, 1974, 1975 and 1976
(The 1970 figures are adjusted for incomplete coverage on the basis of the two sets of figures published in the Business Monitor Series for 1971, quarter 4)

Figures relate to establishments with 25 or more employees.

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[1] Condensed version of definitions given as prefaces to reports on 1973 Census of Production for PA 485/6 and PA 489 (Business Statistics Office 1976).

Table I-1 shows newspapers and periodicals account for a dominant part of sales revenue from publishing in this country and that sale of advertising space is the major source of income for the Press.

Inflation seriously distorts comparisons over the period 1968 to 1976. Correction for inflation can take two forms:

a) adjustment to constant purchasing power, which is useful for comparison of the"real" value of expenditure on published material or the "real" value of company sales, or
b) adjustment by a price index relating to published matter, which is useful for measuring changes in the volume of production. Both adjustments are shown in Table I-2:-

Table I-2 Indices of Publishing Sales Turnover 1968-76

a) in terms of constant purchasing power - deflator used: Index of Retail Prices (all items)
b) in terms of production volume (derived by manipulation of data published in the Business Monitor series)

	(a)	(b)
1968	90	n.a.
1970	100	100
1973	114.3	117
1974	111.3	113
1975	103.9	96
1976	104.9	99

Table I-2 shows a substantial rise in activity in publishing between 1970 and 1973; over this period the volume of production rose by 17 per cent and the real value of total sales by over 14 per cent. During the recession from 1973 to 1976 the real value of sales turnover fell sharply and there was an even greater fall in the volume of production. This difference was due to an increase in average price per copy of newspapers and periodicals approximately 1.3 times that in the index of all retail prices.

Employment in the printing and publishing industries has been much more stable than production. It is not possible to isolate the printing and publication of books; in Table I-3 are set out production and employment statistics for (i) newspaper and periodical publishing and (ii) all other printing and publishing. Books and other published matter accounted for 37 per cent of sales in the latter sub-sector in 1976.

Table I-3 Production and Employment in Publishing 1970-76

(Second quarter of each year)

	Newspapers & Periodicals		Other Printing and Publishing	
	Production (1970=100)	Employment (000s)	Production (1970=100)	Employment (000s)
1970	100	149	100	226
1971	98.2	146	95.8	220
1972	104.5	139	100.2	212
1973	119.1	138	103.5	212
1974	117.0	149	105.1	208
1975	99.1	136	99.3	206
1976	101.5	131	99.4	196

Source: Business Statistics Office and Dept. of Employment.

From Table I-3 it may be calculated that in the production of newspapers and periodicals, output per person employed in 1976 was only 15 per cent higher than in 1970 and was 10 per cent lower than in 1973. Overmanning in the Press was one of topics emphasised in the recent investigation by the Royal Commission on the Press.[1] The prospects for a significant increase in labour productivity with a highly organised skilled labour force and a background of heavy unemployment appear rather slender and negotiations in this respect seem to have progressed only slowly.

In other printing and publishing, increases in labour productivity have also been slow - in 1976, it was only 15 per cent greater than in 1970 and was less than 4 per cent greater than in 1973. Increases in labour costs in relation to sales revenue have contributed to the decline of profitability in the publishing industry in recent years.

2. Overseas Trade in Published Matter

Exports and imports of newspapers and periodicals are fairly small in relation to the value of U.K. sales. In 1975, exports amounted to only £27 millions, or about 5 per cent of the value of production. The main destination countries were Australia, New Zealand and the Irish Republic. Imports amounted to £11m. and were mainly from E.E.C. countries, especially Italy (£4m.) or from the U.S.A.

[1] Report published by HMSO, July 1977.

In the case of books, foreign trade is more significant. Table I-4 shows exports, home sales of U.K. producers and imports annually from 1970 to 1975.

Table I-4 Value of Trade in Books 1970-75 (£m.)

	Exports+	Imports+	Home sales of U.K. producers*	U.K. market
1970	46.9	22.6	95.8	118.4
1971	59.7	25.9	107.8	133.7
1972	69.7	29.6	133.8	163.4
1973	72.2	31.6	142.1	173.7
1974	81.7	39.3	172.2	211.5
1975	101.8	51.2	218.0	269.2

Sources: Overseas Trade Statistics and Business Statistics Office.

+ Exports are valued f.o.b. ("free on board" value on leaving the U.K. port) while imports are valued c.i.f. (value on arrival at the U.K. port, including carriage, insurance and freight).

* This column is derived by subtracting from sales by U.K. publishers the sales of books exported directly or known to be destined to export. Because of time lags, the total value of this export production exceeds the value of exports shown by Overseas Trade Statistics. The sum of columns (1) and (3) of this table is consequently less than column (3) in Table I-1.

The books exported from the U.K. are more expensive in relation to weight than those imported. In 1975 the f.o.b. value of exports was 0.178 pence per gram while that of imports was 0.113 pence per gram. This is partly because imports include a higher proportion of children's books with larger print but the principal reason is the predominance among exports of literary, technical and scientific books.

The largest single market for exports is the U.S.A., the destination of 23 per cent (by value) of books exported in 1975. Other English-speaking countries accounted for much of the rest. The U.S.A. was the source of 40 per cent (by value) of books imported. Trade with other E.E.C. countries was less important, presumably because of language differences.

Whereas U.K. publishers exported 30 per cent (by value) of their total production of books in 1975, imports from overseas represented only 19 per cent (again by value) of the U.K. market. Trade in books is influenced by widespread international agreements, the subject of considerable commercial security. However the predominance in the U.K. of British books (suggested by this statistical analysis) is also clear from our survey of educational publishing: the use of American texts appears to be widespread only in more specialist areas of advanced study.

3. Further Analysis of Sales of Books

In Section II of this report we examine in some detail the segmentation of the total market for newspapers and periodicals and in Section III we report on our survey of text-books used in schools. The market for books is very diverse and, because the topic is not covered elsewhere in this report, we have set out in Table I-5 an analysis of sales of books by U.K. publishers in 1971, 1973 and 1975.

Table I-5 Analysis of Book Sales by Value (£ millions)

	1971	1973	1975
Hard-back			
School textbooks	15.5	19.7	28.1
Technical & Scientific	33.7	37.6	54.0
Fiction, literature & classics	23.4	28.0	41.2
Children's	15.7	17.6	26.9
Other	39.5	49.9	80.7
Paper-back			
School textbooks	14.2	17.2	28.2
Technical & Scientific	5.0	7.5	11.8
Fiction, literature & classics	18.4	23.1	40.7
Children's	4.4	7.0	10.3
Other	9.7	14.0	18.3
TOTAL	179.5	221.6	340.1

Source: Business Monitor Series

The proportion of sales turnover accounted for by paper-backs rose from 28.8 per cent in 1971 to 32.1 per cent in 1975. The data in Table I-5 reveals no other substantial changes in the composition of book sales over the four year period.

B. CONCENTRATION IN PUBLISHING AS A WHOLE

Methodology

The methodology for the measurement of the concentration has been laid down by the Commission of the European Communities.[1] A summary of this methodology is given in Appendix A of this report.

The analysis of concentration is based on two sets of data relating to samples of firms in the industry studied. The first of these refers to sales by establishments within the United Kingdom of the products of that industry; data are collected for sales turnover and any other variables from a list specified by the Commission for which data are available.

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[1] See R. Linda, op. cit.

This level of investigation is concerned with the Economic Activity Unit and the criterion for inclusion of any undertaking in the sample of companies studied is a minimum level of sales from U.K. establishments of the relevant products in a key year. In the present study, the firms included are the first 60 of a larger sample ranked according to sales turnover from published matter in 1970. Another firm which was formed in 1970 and became larger than some of these 60 was added to the sample from 1971 onwards[1].

The second set of data relates to all activities in the U.K. and elsewhere of any enterprise included in the first sample, for which sales of the relevant products from U.K. establishments account for more than 50% of total world turnover in a given year (1970). The term "enterprise" is defined here as in the official definition of the Business Statistics Office:- "a business consisting of one establishment, or of two or more establishments under common ownership or control." Effective control is deemed to occur when any single person or institution or an identical group of persons and/or institutions has an absolute majority of voting shares.

The difference between the Enterprise and Economic Activity Unit (EAU) approaches is demonstrated by the inclusion of the S. Pearson group in both (publishing of books, newspapers and periodicals accounted for 61 percent of group turnover in 1970) but the inclusion of Reed International Ltd. only in the EAU analysis(U.K. publishing accounted for 41 per cent of 1970 turnover).

Because Reed International is the firm with the largest publishing activities in the United Kingdom, its necessary exclusion from the Enterprise analysis means that more meaningful conclusions about concentration in publishing can be drawn from the EAU approach. However, for the EAU analysis, it was possible to obtain data for only two of the ten financial variables specified by the Commission. This is because companies with interests outside publishing normally provide a breakdown by product only for sales turnover and net profits.

In order to study the concentration of other financial variables and to compare the relative financial strengths of the companies concerned, it is necessary to refer to the Enterprise analysis, even though some of the firms with the largest publishing interests are excluded.

The results of the EAU analysis for each of the calendar years are presented and discussed in the following part of the text.(Sub-sections 1-3). The more extensive tables for the Enterprise analysis produced by the Commission's own computer are described in Sections 4 and 5 below.

---

[1] Another of the 60 firms was formed in 1969 and is not included in 1968.

1. Trends in Sales Revenue and Profits - Economic Activity Units

Table I-6 shows the total values of sales and net profits before tax for the sample of firms annually from 1968 to 1975. The third column of data refers to the total of profits and losses by EAU's, the fourth column shows the total of profits only.

Table I-6 Turnover and Profits 1968-75 (Total of EAUs)

	No. of firms	Sales turnover (£ mill.)	Total profits + losses (£ mill.)	Total of profits (£ mill.)	No. of profit-making firms
1968	59	577.1	60.03	60.11	56
1969	60	630.6	52.91	53.35	52
1970	60	695.0	43.62	48.31	53
1971	61	741.5	59.81	61.00	59
1972	61	851.7	94.12	94.12	61
1973	61	999.9	100.54	100.54	61
1974	61	1151.7	77.95	81.18	59
1975	62	1368.2	93.44	96.76	61

N.B. Profits = net profits before tax, attributable to publishing

Source: Company Accounts.

Comparison with Table I-1 shows that the sample of around 60 firms accounts for the majority of sales turnover in publishing represented by establishments with 25 or more employees. The percentage covered by the sample was about 90 per cent throughout the period.

The data in Table I-6 can better be understood in terms of constant purchasing power. Table I-7 shows changes in each of the three totals in index form.

Table I-7 Indices of Turnover and Profits at Constant Purchasing Power (Total of EAUs)

(Deflator used is Index of Retail Prices - all items)

	Sales turnover	Profits + losses	Profits only
1968	100	100.0	100.0
1969	103.6	83.5	84.2
1970	107.3	64.7	71.7
1971	104.7	81.2	82.7
1972	112.3	119.2	119.2
1973	120.7	116.7	116.7
1974	119.8	77.9	81.1
1975	114.6	75.2	77.8

Since 1968 the most profitable period for the publishing industry was the consumer boom of 1972 and 1973, when advertising revenue for the Press was at its peak for this survey period. The average profit margin in relation to sales was also at its peak in these years:-

Table I-8 Net Profits before Tax as Percentage of Sales

(Total of EAUs; losses included in average)

	%		%
1968	10.40	1972	11.05
1969	8.39	1973	10.06
1970	6.28	1974	6.77
1971	8.07	1975	6.82

2. Some general comments regarding Concentration in Publishing

The combination in a single set of calculations of the Press and the publishing of books tends to distort slightly the analysis of concentration. Only four of the 61 firms included in the EAU analysis had significant sales of both books and newspapers/periodicals. These were:-

S. Pearson and Son Ltd. (owners of the Financial Times, Westminster Press, Longmans and Penguin Books Ltd.);

Reed International (Mirror Group newspapers and the International Publishing Corporation with its book-publishing interests in Butterworth and Hamlyn);

The Thomson Organisation (the Times, the Sunday Times, regional newspapers, a range of periodicals and books published by Nelson, Pelham, Hamish Hamilton, and other subsidiaries;

Scottish and Universal Investments Ltd. (a major newspaper publisher in Scotland and owner of Holmes McDougall, book publishers).

Some indication of the distortion is provided by analysis of the EAU data for 1968 and comparison with the Census data for that year. The five-firm concentration ratio for each product range were as follows (our own EAU data):-

Publishing in total	59.5	per cent of the totals
Newspaper & Periodicals	66.9	" for the sample of
Other publishing	42.8	" 59 firms.

The Census of Production for 1968 gave the five-firm ratio for published books as only 32.2 per cent. The discrepancy between this and our own estimate for books and other publishing is explained by the fact that 23 of the 59 firms in the 1968 sample did not publish books at all. This means that the sample included only 36 publishers of books and, while we are satisfied that these were the 36 largest publishers, the structure of book publishing was - and remains - fairly atomistic. The 1968 census showed 88 separate enterprises employing 25 or more people, and there was a large number of book publishers operating on an even smaller scale and accounting for 14 per cent of book sales.[1]

Even in the newspaper/periodical sub-sector the concentration ratios overlook the existence of a large number of small companies not included in our sample. Data are published on the distribution of these companies and these are analysed in Section II below.

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[1] Census of Production 1968: Enterprise Tables and Industry Report No. 143.

3. Standard Concentration Ratios and their Interpretation

Tables I-9 to I-11 show values of the standard concentration ratios for turnover and profits annually from 1968 to 1975, applied to the EAU data.

Table I-9 Concentration of Sales Turnover 1968-75 (EAU)

	Number of firms	Mean (£000)	Coeff.of Variation	Gini coeff.	Herf.-Hirschman	Entropy
1968	59	9,782	2.273	0.705	104.51	-129.62
1969	60	10,509	2.241	0.698	100.38	-131.48
1970	60	11,584	2.187	0.693	96.42	-132.76
1971	61	12,157	2.072	0.677	86.77	-136.16
1972	61	13,962	1.946	0.665	78.46	-138.69
1973	61	16,391	1.864	0.656	73.33	-140.42
1974	61	18,881	1.857	0.662	72.94	-139.97
1975	61	22,430	1.861	0.660	73.17	-139.85

	Concentration ratio for n^* firms				Linda Index for n^* firms			
n^* =	4	8	10	20	4	8	10	20
1968	52.90	69.39	72.99	85.53	0.631	0.464	0.450	0.311
1969	52.36	67.95	72.04	84.99	0.609	0.448	0.418	0.297
1970	49.69	67.23	71.52	84.72	0.629	0.424	0.391	0.279
1971	47.66	65.65	69.92	82.87	0.588	0.393	0.370	0.269
1972	45.75	64.05	68.29	82.00	0.546	0.365	0.349	0.248
1973	44.56	62.84	67.10	81.39	0.530	0.351	0.339	0.234
1974	44.36	62.85	67.45	82.23	0.530	0.341	0.326	0.232
1975	45.14	63.40	68.12	81.97	0.522	0.339	0.321	0.252

Table I-9 shows a distinct decrease in concentration in publishing from 1968 to 1973. All the indices show a progressive annual decrease over this period. After 1973 there are indications of stability. From Table I-11 below, which shows critical values of the Linda index, it will be seen that this Index shows the existence in each of the years 1968 to 1973 of an oligopoly group of seven enterprises. Table I-11 also shows that their combined share of industry sales fell from 67.2 per cent in 1968 to 60.2 per cent in 1973. The seven companies concerned and their individual shares of the market over the complete seven year period are shown in Table I-12.

Table I-10 Concentration of Pre-Tax Profits 1968-75 (EAU)

	Number of firms	Mean (£000)	Coeff. of Variation	Gini Coeff.	Herf.-Hirschman	Entropy
1968	56	1073	2.201	0.708	104.39	-128.7
1969	52	1026	1.923	0.702	90.37	-129.0
1970	53	911	1.563	0.662	64.97	-137.3
1971	59	1034	1.721	0.675	67.16	-139.3
1972	61	1542	1.431	0.636	49.98	-146.9
1973	61	1648	1.461	0.619	51.41	-148.1
1974	59	1376	1.691	0.626	65.42	-143.8
1975	61	1596	1.922	0.675	78.26	-137.3

	Concentration Ratio for n^* firms				Linda Index for n^* firms			
n^* =	4	8	10	20	4	8	10	20
1968	51.02	66.10	71.70	87.26	0.828	0.457	0.374	0.263
1969	48.85	67.23	74.15	89.02	0.606	0.360	0.294	0.261
1970	42.10	61.89	69.10	86.56	0.437	0.267	0.230	0.191
1971	41.42	61.57	68.26	84.83	0.504	0.279	0.245	0.194
1972	36.10	54.50	61.34	81.52	0.304	0.234	0.203	0.159
1973	35.73	53.97	59.51	79.02	0.425	0.275	0.244	0.160
1974	40.24	56.28	61.88	79.00	0.615	0.342	0.290	0.191
1975	48.06	63.15	68.50	82.76	0.530	0.385	0.333	0.251

N.B. In the measurement of concentration indices only positive profits are included (losses are omitted entirely from the computation).

Table I-11 Critical Values of the Linda Index (EAU)

	N^*h	L_{N^*m}	N^*m	L_{N^*m}	CR_{N^*m}	LS
		Sales Turnover (01)				
1968	2	1.142	7	0.4428	67.24	0.6740
1969	2	1.1039	7	0.4465	65.52	0.6732
1970	2	1.2544	7	0.4099	64.91	0.6831
1971	2	1.1412	7	0.3730	63.32	0.6319
1972	2	1.0565	7	0.3457	61.62	0.5839
1973	2	0.9303	7	0.3431	60.20	0.5443
1974	2	0.9225	47	0.1532	97.36	0.2565
1975	2	0.8614	6	0.3519	56.84	0.5499
		Net profits before tax (04)				
1968						
1969	2	0.8643	12	0.2744	79.09	0.4653
1970	2	0.5846	12	0.2182	74.27	0.3336
1971	2	0.9331	23	0.1808	88.33	0.3037
1972	2	0.5126	15	0.1634	74.43	0.2515
1973	2	0.7452	34	0.1275	92.68	0.2182
1974	2	1.1029	37	0.1333	94.96	0.2634
1975	2	0.8299	14	0.2747	75.70	0.4226

Table I-12 Shares of Industry Sales of Seven Largest Companies

	% of total publishing sales in year stated							
	1968	69	70	71	72	73	74	75
IPC/Reed	26.3	25.6	25.3	23.2	21.1	19.6	19.4	18.9
Thomson	11.5	11.6	10.1	10.1	10.0	10.6	10.5	11.0
Assocd. News	7.9	7.6	7.1	6.4	6.3	6.3	6.5	6.1
Beaverbrook	7.2	7.6	7.3	7.1	7.0	6.6	6.3	5.9
Pearson	6.5	5.5	6.7	7.3	7.6	7.8	8.0	9.1
Telegraph	4.1	3.9	3.7	4.1	4.3	3.9	3.7	3.4
News Intl.	3.7	3.8	4.9	5.2	5.4	5.4	5.6	5.9
	67.2	65.5	64.9	63.3	61.6	60.2	60.0	60.3

The main reasons for the comparative decline of some of the largest publishing companies are changes in the relative importance of different sectors of the Press. The circulation of the more popular daily newspapers fell during the survey period and there was also a sharp drop in the circulation of many of the general interest magazines. These changes are discussed in Section II which is concerned with concentration in the Press.

It is important to emphasise that the ranking of net profits is different from that of sales turnover. The seven largest companies in terms of sales accounted for 67 per cent of turnover and 60 per cent of profits in 1968 ; by 1973 the proportions had fallen to 60 and 44 per cent respectively. In the difficult years of 1974 and 1975 some of the largest companies made losses.

In the analysis of market shares we have calculated the Index of Dynamism also defined by the Commission.[1] For sales turnover and net profits the values of this Index in each year were as follows :-

Table 1-13 Index of Dynamism (EAU)

	Sales turnover (01)	Net profits (04)
1968-9	3.46	12.91
1969-70	3.78	15.90
1970-1	4.28	17.85
1972-3	3.17	14.85
1973-4	3.03	16.44
1974-5	3.85	36.03

[1] $D = \frac{a_{it}}{\Sigma a_{it}} - \frac{a_{it-1}}{\Sigma a_{it-1}} \cdot \frac{100}{2}$ See R. Linda, op. cit.

Because net profits represent a balance between flows, their distribution would normally be expected to change much more than that of sales turnover. The Index of Dynamism for sales turnover is unusually low. The progression away from concentration indicated by the analysis of the concentration indices has been a steady one.

An investigation of the possibility of a statistical relationship between size and profit margin (net profits as percentage of sales versus absolute size of sales) produced no significant correlation. This computation was undertaken both with data for individual years and with averages for the eight years. The reason for this absence of correlation is believed to be the compensating for economies of scale on the one hand by the relative decline of those particular activities (especially general periodicals and "popular" national newspapers) which are carried out by the largest publishing groups.

4. Analysis of Other Financial Variables - Enterprise Tables

The enterprise analysis is based on data for world-wide, all-product operations of those enterprises of whose turnover at least 50 per cent is derived from publishing activities in the United Kingdom. The principal companies included in the EAU analysis but excluded from the Enterprise Tables are the following :-

	U.K. publishing turnover 1975 (£m)	Total world-wide turnover 1975
British Electric Traction Ltd.	12.3	437.1
British Printing Corporation Ltd.	32.9	127.5
Granada Group Ltd.	5.4	119.6
Reed International Ltd.	258.9	1063.6
Thomas Tilling Ltd.	10.9	625.6

Reed International obtained nearly 19 per cent of publishing sales in 1975 (26 per cent in 1968 - see Table 1-12 above) and the other four companies obtained a combined share of 4.5 per cent. The exclusion of Reed International from the Enterprise analysis affects the interpretation of the Tables of Concentration.

Table 1 shows the growth of the total for all enterprises in the sample with positive values of the variable concerned in any one year. It is interesting to note that the total value of sales turnover rose more quickly after 1972 than the total of the wage-bill. This may seem a paradox for an industry in which rising labour costs are blamed for increasing financial difficulties. Much of the explanation lies in the inclusion in sales turnover of that from overseas operations, the sterling value of which has appreciated with the devaluation of the pound. The effects of devaluation are also evident in the data for total exports.

On page 3 of Table 1 we include two variables not listed in the Commission's standard specification. These are 9- Net cash flow (Profit after tax plus depreciation) and 10- Net assets or total capital (Total assets minus current liabilities). Net cash flow is

particularly volatile ; if losses as well as profits were included this instability would be even more evident.

Table 2 shows the values of the mean of each variable, the coefficient of variation, the Gini, Herfindahl-Hirschman and Entropy measures of concentration in each of the years 1968-1974 (with data added for 1975 in the case of all variables except 06, gross additions to fixed assets). Most of the coefficients show sales turnover to be the least concentrated of the ten variables in each of the eight years. This result, which casts doubt upon the increasingly-accepted theory that sales revenue maximisation is the primary objective of business, is consistent with results of most of the other studies undertaken by and for the Commission of the European Communities in this series.

Exports are more concentrated than the other variables mainly because exporting is confined principally to book publishers and some of the companies included in the analysis do not publish books.

The concentration of equity capital (07- also known as "shareholders' funds") is understated in these Tables because some enterprises have significant minority holdings in others and the total value of equity is consequently over-stated. These inter-company holdings are confined mainly to the Press sub-sector and, since they also affect companies not included in the Enterprise analysis, they are listed in full in Table II- in the next section. The total value of the double-counted equity in the Enterprise analysis was £8.0 millions in 1975. While this is only 1.5 per cent of the total figure for equity capital in that year, the degree of concentration is under-stated in that control is in a smaller number of groups. The implications for competition are discussed in Section II.

Table 3 shows the concentration ratios and Linda coefficients for each of the ten variables in each of the seven years. For sales turnover, the Linda coefficients indicate the existence of an oligopoly group of six enterprises in 1968 and of five enterprises from 1969 onwards. A similar distinct size-group is shown for the first four years in the Linda analysis of employment and, throughout the period, in the analysis of wage-bill. It is interesting to note that, except in occasional years, no oligopoly groupings are identified for any of the other variables. Although the concentration of sales turnover is less than that of the other variables, there appears to be a distinct oligopoly "threshold" for this variable which is not observed for any of the others.

The three "matrices of oligopolistic interdependence" which follow the Tables of Concentration are described by Linda in some detail[1] and only brief comments on interpretation are set out in this text.

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[1] R. Linda, op. at. pp 38-76

Matrix No. 1 shows the ranking of each of the ten variables according to two criteria - the values of Lh*h and of LS (see Appendix A). The "score" in the body of the matrix is the sum of of the two rankings. The total "scores" of the variables over the eight years can be used to rank them according to their comparative inequality. In the case of profits, the total score is 80 while that for sales turnover is 95. This appears to lend some further support to Linda's finding [1] that the distribution of profits is generally more concentrated than that of sales turnover, though the evidence is less strong than corresponding evidence from other studies.

In only two of the eight years (1969-1976) exports again appear as the variable with the greatest inequality of distribution. The reason for this (the fact that many newspaper companies have negligible exports) has already been explained.

Matrix No. 2 is presented for only two years. (1968 and 1973), chosen to illustrate the entire period. The symbols used in this matrix are as follows :-

Rank 1 = ranking of enterprises according to performance ratio 2r

1r = $\frac{\text{net profits before tax}}{\text{total sales turnover}}$

Rank 2 = ranking of enterprises according to performance ratio 2r

2r = $\frac{\text{net profits before tax}}{\text{equity capital}}$

1 x = ranking by sales turnover

7 x = ranking by equity

The score in the matrix for each firm is the sum of Rank 1 and Rank 2. Where a company is among the top 13 according to one performance ratio but not according to the other the total score (the addition of the two rankings) is shown in parentheses at the end of the column or row.

The numbers representing each firm are merely for identification (Because some of the most profitable companies in the survey period were very small, the use of alphabetic codes to designate size proved impracticable).

Few conclusions can be drawn from Matrix 2 :-

(a) The rankings by the two criteria vary substantially. A major reason for this is the existence of minority interests in some of the publishing companies ; another is variation in the amount of "gearing" (i.e., the extent to which companies use long-term loans as opposed to equity capital). Diversity of policy regarding asset revaluation during the period of rapid inflation may also have distorted the equity figures.

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[1] R. Linda, ibid. p.45

(b) The relationship between size and performance is very weak, as we have already explained on page 13 above, because economics of scale have been offset by changes in the composition of market demand.

A complete statistical investigation, in which each of the following regression calculations was undertaken, yielded no statistically significant correlation.

net profit before tax	/ sales turnover	v	sales turnover
" " "	/ equity	v	equity
" " "	/ net assets	v	net assets
cash flow before tax	/ sales turnover	v	sales turnover
" " "	/ equity	v	equity
" " "	/ net assets	v	net assets
cash flow after tax	/ sales turnover	v	sales turnover
" " "	/ equity	v	equity
" " "	/ net assets	v	net assets

Matrix No. 3 shows the ranking of firms based on growth between successive years of sales turnover (Rank 1, with the growth shown as 1 c) and of net profits (Rank 4 with the growth shown as 4c).

The growth rates are expressed as absolute changes in the company's percentage share of the total value of the variable achieved by all companies. For example, company 53 held 1.38 per cent of sales turnover in 1968 and 2.43 per cent in 1969, so that 1c for 1968-9 was 1.05. In the case of profits, only positive values are used for derivation of the total.

1 X = company's share of turnover in the earlier of the two years.
4 X = company's share of profits in the earlier of the two years.

The score in the matrix is the sum of the two rankings. As in Matrix 2, if a company falls within the first 12 according to one ranking but not according to the other, its "score" is shown at the end of the column or row in which it appears.

This matrix has been constructed on the basis of the EAU data, because these more meaningfully represent publishing activities. The analysis confirms the earlier textual observation that smaller companies have tended to grow at the expense of larger ones in this industry, in spite of the mergers which have taken place and are described in Section II.

TABLES OF CONCENTRATION - ENTERPRISE ANALYSIS

Please refer to p. 13 for interpretation of pp. 17 - 38.

TABLE 1 The Total Values of the Variables (Page 1)

Year	No. of firms	Total Value £m.	Index 1968 = 100 Unadjusted	At constant purch. power
	Variable: 01 Sales Turnover			
1968	44	478.5	100	100
1969	45	521.6	109	103
1970	45	582.7	122	109
1971	46	619.5	129	105
1972	46	817.9	171	130
1973	46	989.2	207	144
1974	46	1149.6	240	144
1975	45	1366.9	286	138
	Variable: 02 Employment (Thousands)			
1968	44	114.6	100	
1969	45	118.6	103	
1970	45	122.5	106	Not
1971	46	120.2	104	applicable
1972	46	129.7	113	
1973	46	130.7	114	
1974	45	135.0	118	
1975	45	118.5	103	
	Variable: 03 Total wage bill			
1968	44	149.2	100	100
1969	45	166.8	111	106
1970	45	195.3	130	117
1971	46	213.6	143	117
1972	46	252.2	169	129
1973	46	289.9	194	135
1974	45	343.5	230	126
1975	45	398.7	267	129

TABLES OF CONCENTRATION - ENTERPRISE ANALYSIS

Table 1 The Total Values of the Variables (Page 2)

Year	No. of firms	Total Value £m.	Index 1968 = 100 Unadjusted	At constant purch. power
	Variable: 04 Net Profits before tax			
1968	42	56.5	100	100
1969	38	53.7	95	90
1970	40	57.6	101	91
1971	45	68.7	121	99
1972	46	108.1	191	145
1973	46	119.9	212	148
1974	43	90.6	160	96
1975	43	108.2	192	93
	Variable: 05 Cash flow			
1968	43	68.2	100	100
1969	42	65.1	95	91
1970	43	70.0	102	92
1971	45	81.7	119	98
1972	46	124.4	182	139
1973	46	138.6	203	141
1974	43	119.9	176	106
1975	43	132.0	194	94
	Variable: 06 Gross capital expenditure			
1968	44	17.92	100	100
1969	45	26.50	147	140
1970	45	27.25	152	136
1971	46	23.61	131	107
1972	46	33.41	186	142
1973	46	55.79	311	217
1974	46	63.21	352	211
1975	-	not available	-	-

TABLES OF CONCENTRATION - ENTERPRISES

Table 1 The Total Values of the Variables (Page 3)

Year	No. of firms	Total Value £m.	Index 1968 = 100 Unadjusted	Index 1968 = 100 At constant purch. power
	Variable: 07 Equity Capital (Shareholders' funds)			
1968	44	257.9	100	100
1969	45	278.6	108	102
1970	44	300.4	116	104
1971	46	342.8	132	108
1972	46	404.1	156	119
1973	46	460.9	178	125
1974	45	486.9	189	113
1975	45	542.7	210	102
	Variable: 08 Exports			
1968	44	34.9	100	100
1969	45	36.9	105	100
1970	45	44.3	126	113
1971	46	51.7	148	121
1972	46	60.4	173	132
1973	46	78.0	223	156
1974	45	99.2	284	170
1975	45	134.8	387	187
	Variable: 09 Net Cash flow			
1968	43	48.1	100	100
1969	42	44.8	93	88
1970	42	50.6	105	94
1971	45	57.8	120	98
1972	46	85.1	176	135
1973	45	84.0	174	122
1974	43	64.8	135	81
1975	42	128.4	267	129
	Variable: 10 Net assets			
1968	44	342.9	100	100
1969	45	348.2	101	96
1970	45	388.9	113	101
1971	46	443.9	129	105
1972	46	529.3	154	117
1973	46	606.0	176	123
1974	45	677.9	198	120
1975	45	771.1	225	109

TABLES OF CONCENTRATION ENTERPRISES

Table 2 Standard Concentration Measures (Page 1)

Variable	No. of firms	Mean	Coefficient of Variation	Concentration indices		
				Gini	Herf-Hirsch.	Entropy
		Year: 1968				
01	44	10.88	1.680	.647	85.0	-129.4
02	44	2.60	1.715	.673	87.6	-126.9
03	44	3.39	1.789	.692	93.3	-124.2
04	42	1.35	1.797	.684	98.4	-123.5
05	43	1.59	1.814	.690	97.5	-123.7
06	44	0.41	1.582	.674	77.9	-128.5
07	44	5.86	1.805	.675	99.3	-124.9
08	44	0.79	2.068	.747	117.2	-115.8
09	43	1.12	1.991	.715	112.8	-119.4
10	44	7.79	2.256	.711	135.3	-116.9
		Year: 1969				
01	45	11.60	1.642	.643	80.3	-131.3
02	45	2.64	1.685	.672	83.5	-128.5
03	45	3.71	1.757	.691	88.9	-125.8
04	38	1.41	1.609	.673	92.0	-122.3
05	43	1.55	1.694	.694	90.0	-123.6
06	45	0.59	1.821	.703	93.8	-124.1
07	45	6.19	1.749	.675	91.9	-126.9
08	45	0.82	1.927	.718	102.5	-121.3
09	42	1.07	1.813	.710	99.7	-120.7
10	45	7.74	2.181	.710	125.1	-118.8

TABLES OF CONCENTRATION ENTERPRISES

Table 2 Standard Concentration Measures (Page 2)

Variable	No. of firms	Mean	Coefficient of Variation	Concentration indices		
				Gini	Herf-Hirsch.	Entropy
		Year: 1970				
01	45	12.96	1.594	0.636	76.9	-132.2
02	45	2.73	1.689	0.672	83.7	-128.4
03	45	4.34	1.762	0.695	89.2	-125.3
04	40	1.44	1.885	0.706	111.0	-118.6
05	43	1.63	1.897	0.718	104.5	-120.2
06	45	0.61	1.862	0.721	97.1	-122.0
07	44	6.83	1.753	0.672	90.5	-127.0
08	45	0.98	2.258	0.741	132.6	-115.5
09	42	1.20	2.030	0.735	115.8	-117.4
10	45	8.65	2.232	0.712	130.0	-118.6
		Year: 1971				
01	46	13.48	1.554	0.616	72.7	-135.4
02	46	2.62	1.712	0.672	83.7	-192.3
03	46	4.65	1.764	0.695	87.5	-126.3
04	45	1.53	1.913	0.695	101.3	-124.5
05	45	1.82	1.835	0.683	94.9	-126.4
06	46	0.51	1.614	0.692	76.7	-128.5
07	46	7.46	1.891	0.677	97.4	-126.9
08	46	1.13	2.316	0.745	135.4	-115.4
09	45	1.29	1.954	0.696	104.7	-124.0
10	46	9.66	2.311	0.706	134.9	-119.1

TABLES OF CONCENTRATION ENTERPRISES

Table 2 Standard Concentration Measures (Page 3)

Variable	No. of firms	Mean	Coefficient of Variation	Concentration indices Gini	Herf-Hirsch.	Entropy
		Year: 1972				
01	46	17.80	1.639	.633	78.4	-133.1
02	46	2.82	1.830	.686	92.5	-126.8
03	46	5.49	1.796	.700	89.9	-125.5
04	46	2.35	1.756	.664	86.9	-129.9
05	46	2.71	1.743	.662	85.9	-130.2
06	46	0.73	1.629	.689	77.7	-128.7
07	46	8.80	1.934	.682	100.8	-126.3
08	46	1.32	2.581	.752	163.0	-111.4
09	46	1.85	1.862	.675	95.1	-127.8
10	46	11.52	2.336	.711	137.4	-118.6
		Year: 1973				
01	46	21.53	1.683	.636	81.5	-132.4
02	46	2.84	1.864	.689	95.2	-126.1
03	46	6.31	1.810	.703	90.9	-125.0
04	46	2.61	1.763	.663	87.4	-129.7
05	46	3.02	1.751	.657	86.5	-130.3
06	46	1.21	1.882	.721	96.6	-123.0
07	46	10.03	1.895	.670	97.7	-127.7
08	46	1.70	2.628	.762	168.2	-109.9
09	45	1.87	1.868	.667	97.6	-127.3
10	46	13.19	2.310	.707	134.8	-119.1

TABLES OF CONCENTRATION ENTERPRISES

Table 2 Standard Concentration Measures (Page 4)

Variable	No. of firms	Mean	Coefficient of Variation	Concentration indices Gini	Herf-Hirsch.	Entropy
		Year: 1974				
01	46	25.00	1.658	.639	81.5	-131.7
02	46	2.93	1.832	.676	94.7	-126.7
03	46	7.47	1.799	.697	92.1	-124.9
04	44	2.06	1.687	.644	87.4	-129.4
05	44	2.73	1.601	.643	81.0	-130.3
06	46	1.41	1.579	.680	75.9	-129.2
07	46	10.58	1.903	.659	100.4	-127.7
08	37	2.68	2.330	.699	173.8	-109.3
09	44	1.47	1.855	.656	101.0	-126.4
10	46	14.73	2.263	.707	133.1	-118.5
		Year: 1975				
01	45	30.38	1.649	.627	82.7	-131.7
02	45	2.64	1.656	.657	83.1	-129.4
03	45	8.86	1.815	.689	95.4	-124.4
04	43	2.52	1.751	.661	94.6	-126.1
05	43	3.07	1.727	.657	92.6	-126.5
06	-	-	not available	-	-	-
07	45	12.06	1.873	.671	100.2	-125.7
08	36	3.75	2.199	.732	162.2	-105.7
09	42	3.06	2.982	.779	235.6	- 97.6
10	45	17.14	2.114	.686	121.5	-121.7

TABLES OF CONCENTRATION - ENTERPRISES

Table 3 Linda indices (L) and Concentration Ratios (CR) (Page 1)

No. of firms =		4	8	10	N^*h	L	N^*m	L
			Variable: 01 Sales Turnover					
1968	CR	51.7	68.5	72.8	2	.690	6	.361
	L	.420	.405	.377			LS=0.472	
1969	CR	49.6	67.8	72.5	2	.785	5	.340
	L	.396	.364	.338			LS=0.509	
1970	CR	48.1	67.0	71.8	2	.626	5	.306
	L	.385	.355	.331			LS=0.449	
1971	CR	45.2	64.4	69.4	2	.919	5	.313
	L	.402	.340	.309			LS=0.551	
1972	CR	48.0	65.6	70.1	3	.573	5	.363
	L	.448	.364	.344			LS=0.472	
1973	CR	49.3	66.1	70.6	3	.597	5	.398
	L	.478	.376	.354			LS=0.507	
1974	CR	49.5	66.0	71.2	3	.571	5	.404
	L	.470	.373	.334			LS=0.498	
1975	CR	50.3	66.3	71.2	3	.556	5	.417
	L	.464	.377	.343			LS=0.488	
			Variable: 02 Employment					
1968	CR	53.2	69.0	74.0	2	.513	5	.356
	L	.399	.406	.355			LS=0.422	
1969	CR	51.5	68.8	73.9	2	.543	6	.358
	L	.399	.371	.334			LS=0.418	
1970	CR	51.3	68.8	73.8	2	.522	5	.352
	L	.404	.379	.336			LS=0.427	
1971	CR	51.2	67.7	73.1	2	.507	5	.382
	L	.419	.382	.327			LS=0.449	
1972	CR	52.9	69.3	74.2	2	.649	7	.409
	L	.508	.413	.366			LS=0.509	
1973	CR	53.7	70.3	75.0	2	.650	21	.265
	L	.523	.415	.376			LS=0.379	
1974	CR	53.0	69.1	73.9	2	.704	17	.276
	L	.558	.428	.382			LS=0.411	
1975	CR	50.3	67.8	73.3	2	.548	13	.268
	L	.461	.366	.321			LS=0.376	

TABLES OF CONCENTRATION ENTERPRISES

Table 3 Linda indices (L) and Concentration Ratios (CR) (Page 2)

No. of firms =		4	8	10	N^*h	L	N^*m	L
			Variable: 03 Wage bill					
1968	CR	55.8	72.1	76.5	2	.686	5	.348
	L	.366	.423	.387			LS= 0.460	
1969	CR	54.1	71.9	76.6	2	.693	5	.347
	L	.354	.362	.350			LS= 0.459	
1970	CR	53.7	72.2	77.0	2	.694	5	.326
	L	.360	.366	.346			LS= 0.455	
1971	CR	52.7	71.6	76.3	2	.648	5	.320
	L	.368	.353	.341			LS= 0.456	
1972	CR	53.3	71.5	76.7	2	.525	5	.343
	L	.392	.368	.339			LS= 0.441	
1973	CR	53.6	72.5	77.4	2	.506	5	.327
	L	.385	.360	.349			LS= 0.425	
1974	CR	53.9	71.9	77.0	2	.501	5	.354
	L	.411	.371	.348			LS= 0.437	
1975	CR	54.3	71.9	77.2	2	.537	5	.385
	L	.467	.394	.357			LS= 0.477	
			Variable: 04 Net profits before tax					
1968	CR	54.7	70.7	76.5	2	.687	5	.483
	L	.533	.407	.346			LS= 0.571	
1969	CR	52.3	71.8	78.8	2	.542	11	.267
	L	.478	.335	.283			LS= 0.388	
1970	CR	54.6	73.7	79.8	3	.859	11	.332
	L	.641	.386	.339			LS= 0.517	
1971	CR	52.1	70.6	76.5	2	1.203	23	.249
	L	.580	.380	.332			LS= 0.394	
1972	CR	49.4	65.2	71.1	2	1.052	30	.202
	L	.515	.378	.319			LS= 0.321	
1973	CR	50.5	66.7	71.9	2	.847	31	.196
	L	.510	.393	.347			LS= 0.319	
1974	CR	48.2	67.2	73.4	2	1.205	11	.297
	L	.541	.340	.298			LS= 0.491	
1975	CR	52.1	69.4	74.1	2	.929	32	.206
	L	.536	.377	.363			LS= 0.329	

TABLES OF CONCENTRATION ENTERPRISES

Table 3 Linda indices (L) and Concentration Ratios (CR) (Page 3)

No. of firms =		4	8	10	N^*h	L	N^*m	L
			Variable: 05 Cash flow					
1968	CR	54.1	70.7	76.6	2	.682	11	.313
	L	.543	.405	.340			LS= 0.460	
1969	CR	51.7	71.9	78.4	2	.512	11	.262
	L	.474	.309	.280			LS= 0.377	
1970	CR	53.6	73.1	79.5	2	.781	11	.307
	L	.610	.362	.315			LS= 0.482	
1971	CR	51.1	69.6	74.8	2	1.040	22	.243
	L	.561	.369	.342			LS= 0.381	
1972	CR	49.5	65.1	71.1	2	.943	31	.200
	L	.512	.383	.319			LS= 0.314	
1973	CR	50.5	66.5	71.6	2	.785	31	.199
	L	.508	.394	.348			LS= 0.317	
1974	CR	47.0	67.5	73.7	2	.976	11	.264
	L	.475	.300	.277			LS= 0.433	
1975	CR	52.9	69.4	74.5	2	.980	10	.348
	L	.475	.375	.348			LS= 0.495	
			Variable: 06 Gross capital expenditure					
1968	CR	49.8	69.2	75.1	2	.554	4	.321
	L	.320	.289	.278			LS= 0.433	
1969	CR	52.6	72.9	77.1	2	.788	6	.355
	L	.466	.359	.368			LS= 0.515	
1970	CR	54.2	73.3	79.6	2	.669	11	.302
	L	.501	.358	.313			LS= 0.419	
1971	CR	47.1	69.6	75.6	2	.546	6	.279
	L	.376	.271	.264			LS= 0.383	
1972	CR	47.5	67.7	75.2	2	.561	10	.246
	L	.407	.277	.246			LS= 0.369	
1973	CR	51.9	72.1	77.9	2	.786	16	.267
	L	.543	.344	.315			LS= 0.396	
1974	CR	47.0	68.3	74.1	2	.582	9	.273
	L	.387	.284	.274			LS= 0.366	
1975	CR	NOT AVAILABLE						
	L						LS=	

TABLES OF CONCENTRATION ENTERPRISES

Table 3 Linda indices (L) and Concentration Ratios (CR) (Page 4)

No. of firms =		4	8	10	N^*h	L	N^*m	L
		Variable: 07 Equity Capital						
1968	CR	52.8	70.6	75.9	2	.896	12	.330
	L	.669	.389	.351			LS= 0.500	
1969	CR	53.0	69.7	75.3	2	.826	13	.310
	L	.497	.384	.339			LS= 0.445	
1970	CR	50.3	69.8	75.7	2	.879	11	.286
	L	.524	.331	.303			LS= 0.458	
1971	CR	51.5	69.7	75.2	2	.948	11	.314
	L	.597	.374	.337			LS= 0.507	
1972	CR	51.6	69.5	74.7	2	1.063	13	.313
	L	.629	.392	.355			LS= 0.503	
1973	CR	50.7	68.9	73.8	2	1.156	7	.383
	L	.606	.384	.352			LS= 0.656	
1974	CR	50.0	68.7	74.0	2	1.426	13	.309
	L	.661	.358	.336			LS= 0.529	
1975	CR	52.5	71.0	76.0	2	1.139	12	.326
	L	.554	.353	.347			LS= 0.504	
		Variable: 08 Exports						
1968	CR	56.8	73.3	78.9	2	1.071	19	.259
	L	.633	.453	.380			LS= 0.438	
1969	CR	53.6	69.5	75.4	2	.953	3	.628
	L	.629	.426	.355			LS= 0.790	
1970	CR	57.8	72.2	77.3	2	1.301	23	.264
	L	.810	.523	.436			LS= 0.469	
1971	CR	57.9	71.9	77.2	2	1.262	3	.866
	L	.900	.536	.439			LS= 1.064	
1972	CR	60.1	72.7	77.6	2	1.698	3	1.074
	L	1.085	.619	.503			LS= 1.386	
1973	CR	60.5	74.8	79.2	2	1.807	24	.278
	L	1.031	.582	.512			LS= 0.561	
1974	CR	61.1	75.1	79.3	2	2.002	24	.283
	L	1.001	.602	.529			LS= 0.582	
1975	CR	66.0	79.2	83.5	3	1.076	23	.354
	L	0.841	.604	.530			LS= 0.541	

TABLES OF CONCENTRATION ENTERPRISES

Table 3 Linda indices (L) and Concentration Ratios (CR) (Page 5)

No. of firms =		4	8	10	N^*h	L	N^*m	L
		Variable: 09 Net cash flow						
1968	CR	57.3	73.6	79.1	2	.781	11	.350
	L	.616	.441	.381			LS= 0.519	
1969	CR	54.7	73.7	80.3	2	.574	11	.291
	L	.517	.349	.307			LS= 0.419	
1970	CR	56.4	74.7	81.2	2	.875	11	.330
	L	.649	.395	.340			LS= 0.530	
1971	CR	52.7	70.4	76.2	2	1.068	22	.263
	L	.646	.404	.350			LS= 0.411	
1972	CR	50.9	67.0	72.7	2	1.032	27	.222
	L	.589	.391	.337			LS= 0.359	
1973	CR	52.7	67.7	73.4	2	.913	5	.512
	L	.572	.434	.359			LS= 0.693	
1974	CR	51.8	68.8	74.8	2	1.044	10	.344
	L	.652	.412	.344			LS= 0.564	
1975	CR	71.3	81.9	84.9	2	1.520	33	.411
	L	1.226	.842	.777			LS= 0.680	
		Variable: 10 Net assets						
1968	CR	59.7	73.6	78.3	4	.936	13	.417
	L	.936	.560	.474			LS= 0.624	
1969	CR	60.2	73.4	78.0	3	.824	13	.409
	L	.672	.540	.471			LS= 0.568	
1970	CR	58.5	73.3	78.2	3	.995	36	.255
	L	.786	.519	.441			LS= 0.411	
1971	CR	58.2	72.5	76.9	3	1.088	36	.241
	L	.873	.537	.473			LS= 0.424	
1972	CR	57.9	72.3	76.9	3	1.144	34	.253
	L	.912	.534	.465			LS= 0.436	
1973	CR	57.9	72.6	77.4	3	1.084	38	.245
	L	.876	.518	.449			LS= 0.415	
1974	CR	58.9	74.3	78.3	2	1.055	11	.446
	L	.784	.486	.471			LS= 0.654	
1975	CR	55.7	71.2	76.8	2	1.082	12	.371
	L	.776	.458	.394			LS= 0.606	

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

Matrix No. 1: Oligopolistic Inequality - ENTERPRISES 1968

Ranking II	Variable	Ranking I	1	2	3	4	5	6	7	8	9	10
		Variable	08	10	07	09	01	04	03	05	06	02
		Ln*h / LS	1.071	.936	.896	.781	.690	.687	.686	.682	.554	.513
1	10	0.624		3								
2	04	0.571						8				
3	09	0.519				7						
4	07	0.500			7							
5	01	0.472					10					
6	03	0.460							13			
7	05	0.460								15		
8	08	0.438	9									
9	06	0.433									18	
10	02	0.422										20

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

Matrix No. 1: Oligopolistic Inequality - ENTERPRISES 1969

Ranking II	Variable	Ranking I	1	2	3	4	5	6	7	8	9	10
		Variable	08	07	10	06	01	03	09	02	04	05
		Ln*h / LS	.953	.826	.824	.788	.785	.693	.574	.543	0.542	0.512
1	08	.790	2									
2	10	.568			5							
3	06	.515				7						
4	01	.509					9					
5	03	.459						11				
6	07	.445		8								
7	09	.419							14			
8	02	.418								16		
9	04	.388									18	
10	05	.377										20

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

Matrix No. 1: Oligopolistic Inequality - ENTERPRISE 1970

Ranking II	Variable	Ranking I	1	2	3	4	5	6	7	8	9	10
		Variable	08	10	07	09	04	05	03	06	01	02
		Ln*h / LS	1.301	.995	.879	.875	.859	.781	.694	.669	.626	.522
1	09	.530					5					
2	04	.517						9				
3	05	.482							9			
4	08	.469										
5	07	.458				8						
6	03	.455							13			
7	01	.449		8						16		
8	02	.427									18	
9	06	.419								15		
10	10	.411			12							

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

Matrix No. 1: Oligopolistic Inequality - ENTERPRISES 1971

Ranking II	Variable	Ranking I	1	2	3	4	5	6	7	8	9	10
		Variable	08	04	10	09	05	07	01	03	06	02
		Ln*h / LS	1.262	1.203	1.088	1.068	1.040	.948	.919	.648	.546	.507
1	08	1.064	2									
2	01	.551							9			
3	07	.507						9				
4	03	.456							12			
5	02	.449									15	
6	10	.424			9							
7	09	.411				11						
8	04	.394		10								
9	06	.383									18	
10	05	.381					15					

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

Matrix No. 1: Oligopolistic Inequality - ENTERPRISES 1972

Ranking II	Variable	Ranking I	1	2	3	4	5	6	7	8	9	10
		Variable	08	10	07	04	09	05	02	01	06	03
		LS \ Ln*h	1.698	1.144	1.063	1.052	1.032	.943	.649	.573	.561	.525
1	08	1.386	2									
2	07	.503			5							
3	01	.472							11			
4	03	.441								14		
5	10	.436		7								
6	02	.409						13				
7	06	.369								16		
8	09	.359					13					
9	04	.321				13						
10	05	.314						16				

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

Matrix No. 1: Oligopolistic Inequality - ENTERPRISES 1973

Ranking II	Variable	Ranking I	1	2	3	4	5	6	7	8	9	10
		Variable	08	07	10	09	04	06	05	02	01	03
		LS \ Ln*h	1.807	1.156	1.084	.913	.847	.786	.785	.650	0.597	0.506
1	09	.693				5						
2	07	.656		4								
3	08	.561	4									
4	01	.507							13			
5	03	.425								15		
6	10	.415			9							
7	06	.396						13				
8	04	.319					13					
9	05	.317							16			
10	02	.265								18		

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

Matrix No. 1: Oligopolistic Inequality - ENTERPRISES 1974

Ranking II	Variable	Ranking I	1	2	3	4	5	6	7	8	9	10
		Variable	08	07	04	10	09	05	02	06	01	03
		LS \ Ln*h	2.002	1.426	1.205	1.055	1.044	.976	.704	.582	.571	.501
1	10	.654				5						
2	08	.582	3									
3	09	.564						8				
4	07	.529		6								
5	01	.498								14		
6	04	.491			9							
7	03	.437									17	
8	05	.433						14				
9	06	.366								17		
10	02	.276							17			

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

Matrix No. 1: Oligopolistic Inequality - ENTERPRISES 1975

Variable 06 omitted.

Ranking II	Variable	Ranking I	1	2	3	4	5	6	7	8	9	10
		Variable	09	07	10	08	05	04	01	02	03	
		Ln*h / LS	1.520	1.139	1.082	1.076	.980	.929	.556	.548	.537	
1	09	.680	2									
2	10	.606			5							
3	08	.541				7						
4	07	.504										
5	05	.495					10					
6	01	.488							13			
7	03	.477									16	
8	04	.329						14				
9	02	.268								17		
10												

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

Matrix No. 2: Comparative Performance - ENTERPRISES 1968

2r / 1r			Rank 1	1	2	3	4	5	6	7	8	9	10	11	12	13	
			Firm	16	56	46	53	49	22	33	48	5	50	34	7	38	
			1r	31.9	28.8	23.0	23.0	22.8	20.7	20.4	19.3	18.8	18.8	17.5	17.4	16.6	
Rank 2	Firm	2r	7x \ 1x	7	30	29	14	25	33	28	10	15	2	8	19	20	
1	38	47.2	29													14	
2	33	42.7	31							9							
3	49	35.6	23					8									
4	4	33.4	22														(22)
5	53	32.7	11				9										
6	44	32.5	40														(33)
7	56	32.1	19		9												
8	16	30.1	5	9													
9	34	30.0	9											20			
10	55	26.7	34														(42)
11	7	26.4	16												23		
12	22	25.8	26						18								
13	1	25.5	27														(41)
						(23)					(39)	(36)	(36)				

(See page 24 for explanation)

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

Matrix No. 2: Comparative Performance - ENTERPRISES 1973[1]

2r			1r	Rank 1	1	2	3	4	5	6	7	8	9	10	11	12	13	
				Firm	56	49	16	17	53	13	46	33	57	37	50	54	34	
				1r	34.0	28.1	25.4	24.5	23.7	23.6	23.3	20.6	19.6	17.7	16.2	16.2	16.1	
Rank 2	Firm	2r	7x \ 1x		35	25	13	30	8	38	33	28	36	14	2	10	12	
1	27	134.1	5															(16)
2	13	85.4	37							8								
3	37	85.3	26											13				
4	41	72.4	38															(40)
5	44	68.3	42															(35)
6	30	58.8	46															(49)
7	32	53.8	39															(23)
8	49	52.9	21			10												
9	38	46.8	28															(29)
10	17	42.4	22					14										
11	12	41.8	41															(40)
12	33	39.0	27									20						
13	1	36.8	25															(45)
				(15)		(34)		(30)			(25)		(35)		(45)	(42)	(32)	

[1] Chosen because 1974 and 1975 were exceptional years.

(See page 24 for explanation)

MATRIX NO. 3 - COMPARATIVE GROWTH RATES 1968-9

(see page 16 for definitions)

ECONOMIC ACTIVITY UNITS

4c \ 1c			Rank	1	2	3	4	5	6	7	8	9	10	11	12	
			Company	53	66	2	30	11	51	9	52	40	39	48	62	
			1c	1.05	0.43	0.37	0.27	0.22	0.22	0.19	0.10	0.10	0.08	0.07	0.05	
Rank	Company	4c	4x \ 1x	1.38	0.82	7.20	0.33	0.00	0.67	1.73	11.50	3.66	0.31	1.38	0.10	
1	53	0.17	0.28	2												
2	40	0.10	0.44									11				
3	6	0.03	0.03													(57)
4	51	0.03	0.05						10							
5	3	0.02	0.03													(34)
6	27	0.02	0.00													(26)
7	30	0.02	0.02				11									
8	38	0.02	0.11													(24)
9	54	0.02	0.25													(36)
10	1	0.01	0.07													(30)
11	2	0.01	0.26			14										
12	39	0.01	0.01										22			
					(63)			(20)		(52)	(68)			(56)	(27)	

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

MATRIX NO. 3 - COMPARATIVE GROWTH RATES 1969-70

(see page 16 for definitions)

ECONOMIC ACTIVITY UNITS

4c \ 1c			Rank	1	2	3	4	5	6	7	8	9	10	11	12	
			Company	50	40	30	9	26	39	27	48	51	7	6	4	
			1c	1.19	1.15	0.40	0.17	0.16	0.14	0.07	0.06	0.05	0.05	0.04	0.03	
Rank	Company	4c	4x \ 1x	5.46	3.76	0.60	1.92	1.64	0.39	0.33	1.45	0.89	0.60	0.64	0.56	
1	4	0.11	0.05												13	
2	66	0.09	0.01													(59)
3	40	0.05	0.53		5											
4	39	0.03	0.02						10							
5	50	0.03	0.30	6												
6	17	0.02	0.06													
7	19	0.02	0.01													(42)
8	27	0.01	0.02							15						
9	44	0.01	0.03													(21)
10	48	0.01	0.16								18					
11	51	0.01	0.07									20				
12	61	0.01	0.01													(40)
						(55)	(58)	(25)					(21)	(22)		

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

MATRIX NO. 3 - COMPARATIVE GROWTH RATES 1970-71

(see page 16 for definitions)

ECONOMIC ACTIVITY UNITS

4c \ 1c	Rank	1	2	3	4	5	6	7	8	9	10	11	12	
	Company	37	50	15	40	39	54	49	30	26	6	28	18	
	1c	0.92	0.64	0.41	0.26	0.24	0.19	0.17	0.15	0.15	0.14	0.11	0.08	
Rank / Company / 4c	4x \ 1x	0.00	6.65	3.65	4.91	0.53	1.85	0.58	0.99	1.79	0.68	0.61	0.58	
1 / 47 / 0.55	0.80													(58)
2 / 37 / 0.24	0.00	3												
3 / 15 / 0.19	0.00			6										
4 / 14 / 0.15	0.31													(73)
5 / 50 / 0.14	0.34		7											
6 / 5 / 0.07	0.06													(43)
7 / 28 / 0.05	0.02											19		
8 / 54 / 0.05	0.25						14							
9 / 26 / 0.04	0.00								18					
10 / 45 / 0.04	0.00													(65)
11 / 33 / 0.03	0.08													(29)
12 / 51 / 0.03	0.08													(25)
					(20)	(31)		(23)	(24)		(68)		(26)	

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

MATRIX NO. 3 - COMPARATIVE GROWTH RATES 1971-72

(see page 16 for definitions)

4c \ 1c			Rank	1	2	3	4	5	6	7	8	9	10	11	12	
			Company	37	39	41	50	15	40	18	34	6	26	38	53	
			1c	0.66	0.61	0.39	0.31	0.19	0.19	0.14	0.12	0.11	0.11	0.11	0.09	
Rank	Company	4c	4x \ 1x	0.92	0.78	0.60	7.29	4.06	5.18	0.66	1.12	0.82	1.94	0.68	2.33	
1	50	0.30	0.48				5									
2	52	0.27	0.72													(60)
3	2	0.25	0.10													(56)
4	26	0.25	0.04										14			
5	40	0.21	0.60						11							
6	37	0.15	0.24	7												
7	39	0.15	0.05		9											
8	15	0.13	0.19					13								
9	14	0.12	0.46													(58)
10	53	0.12	0.36												22	
11	9	0.06	0.00													(71)
12	46	0.06	0.07													(34)
						(18)				(21)	(31)	(24)		(29)		

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

MATRIX NO. 3 - COMPARATIVE GROWTH RATES 1972-73

(see page 16 for definitions)

4c \ 1c	Rank	1	2	3	4	5	6	7	8	9	10	11	12	
	Company	9	52	48	53	50	27	5	37	54	13	51	32	
	1c	0.67	0.54	0.30	0.20	0.17	0.14	0.11	0.10	0.09	0.08	0.08	0.07	
Rank / Company / 4c	4x \ 1x	0.84	10.00	1.53	2.43	7.60	0.55	1.20	1.58	2.12	0.35	0.97	0.32	
1 / 52 / 0.25	0.99		3											(24)
2 / 49 / 0.09	0.11													
3 / 53 / 0.09	0.49				7									
4 / 50 / 0.05	0.78					9								
5 / 13 / 0.04	0.05										15			
6 / 35 / 0.04	0.03													(63)
7 / 17 / 0.03	0.11													(24)
8 / 32 / 0.03	0.02												20	
9 / 1 / 0.02	0.10													(46)
10 / 9 / 0.02	0.06	11												
11 / 27 / 0.02	0.07						17							
12 / 39 / 0.02	0.20													(53)
				(31)				(63)	(64)	(38)		(26)		

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

MATRIX NO. 3 - COMPARATIVE GROWTH RATES 1973-74

(see page 16 for definitions)

ECONOMIC ACTIVITY UNITS

4c \ 1c	Rank	1	2	3	4	5	6	7	8	9	10	11	12	
	Company	54	9	50	48	16	14	40	35	32	29	65	27	
	1c	0.71	0.60	0.24	0.22	0.14	0.13	0.13	0.12	0.11	0.08	0.07	0.06	
Rank / Company / 4c	4x \ 1x	2.21	1.51	7.77	1.83	1.86	6.32	5.43	1.11	0.39	0.60	0.17	0.68	
1 / 5 / 0.15	0.02													(21)
2 / 9 / 0.11	0.08		4											
3 / 22 / 0.03	0.03													(25)
4 / 52 / 0.03	1.24													(53)
5 / 4 / 0.01	0.05													(22)
6 / 11 / 0.01	0.01													(19)
7 / 24 / 0.01	0.01													(22)
8 / 25 / 0.01	0.03													(28)
9 / 31 / 0.01	0.00													(45)
10 / 35 / 0.01	0.07								18					
11 / 59 / 0.01	0.01													(29)
12 / 65 / 0.01	0.03											23		
		(50)		(63)	(27)	(57)	(64)	(68)		(49)	(22)		(24)	

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

MATRIX NO. 3 - COMPARATIVE GROWTH RATES 1974-75

(see page 16 for definitions)

ECONOMIC ACTIVITY UNITS

4c \ 1c	Rank	Company	4c	1x / 4x	1	2	3	4	5	6	7	8	9	10	11	12	
				Rank	1	2	3	4	5	6	7	8	9	10	11	12	
				Company	50	41	52	40	9	35	54	44	16	1	45	28	
				1c	1.13	0.70	0.47	0.31	0.29	0.26	0.19	0.11	0.06	0.05	0.05	0.04	
				1x	8.01	0.01	10.51	5.56	2.12	1.23	2.92	0.47	2.00	0.54	1.31	0.80	
Rank	Company	4c		4x													
1	50	0.72	0.57		2												
2	40	0.38	0.29					6									
3	47	0.30	0.48														(63)
4	15	0.23	0.00														(60)
5	16	0.21	0.18										14				
6	2	0.15	0.00														(65)
7	34	0.09	0.11														(57)
8	41	0.05	0.01			10											
9	54	0.05	0.25								16						
10	45	0.03	0.03												22		
11	66	0.03	0.00														(45)
12	25	0.02	0.04														(25)
							(64)		(47)	(49)		(39)		(53)		(26)	

SECTION II

EVOLUTION OF CONCENTRATION IN THE NEWSPAPER AND PERIODICALS INDUSTRY IN THE UNITED KINGDOM 1968-1975

Definitions :

Newspapers :- national daily and Sunday newspapers and local newspapers appearing at least once per week.

Periodicals :- national publications issued at regular intervals exceeding 24 hours.

These definitions, which are used both within the industry and by government and other statistical services, are based on practical considerations. Local weekly publications are generally of newspaper dimensions (broadsheet or tabloid) and their production is similar to that of national dailies. National periodicals are of widely different sizes, paper qualities and methods of printing and production.

A. GENERAL SURVEY OF TRENDS IN THE U.K. PRESS

1. Total Revenue Table II-1 shows total revenue derived from sales of newspapers and periodicals by companies with 25 or more employees from 1968 to 1975, in terms of current prices and in the form of an index at 1968 purchasing power.

Table II-1 Press - Total Revenue 1968-75

	Sales of copy £m	Advertising £m	Total £m	Index of total 1968-100 (inflation adjusted)
1968	227	255	482	100
1970	272	320	592	110
1973	362	496	858	124
1974	430	521	951	118
1975	531	547	1078	108

Sources : Census of Production, Business Monitor

Table II-1 shows the importance of advertising as a source of revenue varying from a peak for the five years shown of 57.8 per cent in 1973 to a low of 50.8 per cent in 1975. The dependence upon advertising varies considerably between different kinds of publications :-

Table II-2 Analysis of Revenue by Kind of Publication (1975)

Newspaper category	Total turnover (£m)	% advertising	Total turnover (£m)	% advertising
National Sundays	106.8	43.8	87.1	52.0
National dailies	252.0	36.4	187.9	48.9
Local weeklies	119.4	81.5	97.8	84.0
Other regional papers	279.2	60.4	229.9	66.8
All newspapers	757.4	53.3	602.7	61.9
Periodicals : specialist	116.6	59.9	93.2	64.0
other	203.6	36.0	162.1	39.4
TOTAL	1077.6	50.8	858.0	57.8

Source : Business Monitor

Note that "specialist" periodicals are more accurately described by the Business Statistics Office as trade, technical and professional periodicals.

2. More Detailed Analysis of Advertising

Advertising is usually divided into two categories - display and classified, although the distinction is sometimes arbitrary.

Table II-1 shows an analysis of advertising over the survey period. The forms described as "other" include (i) advertising in trade and technical journals (as opposed to general periodicals) and (ii) company reports and accompanying publicity material.

Table II-3 Total Advertising by Type 1968-75 (£m)

	1968	1972	1973	1974	1975
Display Advertising					
Press	193	270	322	328	360
Television	129	176	210	203	236
Other Media*	27	34	40	48	53
Total display	349	480	572	579	649
Classified	98	150	213	228	218
Other	46	61	73	80	86
Total advertising	503	708	874	900	967

Source : Advertising Quarterly (Advertising Association), Summer 1976 Table 5

*posters, public transport, cinema and commercial radio .

Display advertising is not dominated by any individual industry or group of industries. About 63 per cent in 1973 and 60 per cent in 1975 was accounted for by manufacturers' and suppliers' consumer advertising the rest being by government bodies, charities. financial institutions and retailers.

The press share of display advertising has remained between 55 and 60 per cent since 1963, television ownership having reached saturation level by that date. Commercial radio first became legal only in 1973 and its impact on local press advertising may not yet be apparent[1].

Display advertising has proved very sensitive to changes in economic conditions. In real terms it has varied as follows over the survey period :-

	Total display advertising at 1970 purchasing power (£m)	Total display advertising as % of Gross Domestic Production
1968	391	0.94
1969	395	0.93
1970	373	0.85
1971	374	0.83
1972	410	0.87
1973	451	0.89
1974	394	0.78
1975	355	0.70

Source : Advertising Association (figures in column 1 deflated by Index of Retail Prices)

The volatility of display advertising in relation to Gross Domestic Product may be demonstrated by a regression equation which relates the year-by-year growth of display advertising to the year-by-year growth of GDP over the years 1961-75 :-

$$\Delta \text{Log}_e \text{(Display advertising)} = 2.61\ (\Delta \text{Log}_e \text{GDP}) - 0.064$$
$$(t=3.90) \qquad R^2 = 0.54$$
$$D.W. = 1.88$$

This equation suggests that a zero increase in GDP would lead to a 6.2% decline in display advertising ; a 5% increase in GDP would lead to a 6.5% increase in expenditure on display advertising.

Classified advertising is especially important for some categories of newspaper (described below). Three topics dominate classified advertising - recruitment, property sales and motor-cars (especially second-hand). Recruitment advertising is very sensitive to changes in the labour market and expenditure fell (even without adjustment for inflation) between 1973 and 1975. In the first of these years, recruitment advertising of £105 millions accounted for 57 per cent of all classified advertising ; in 1975 only £75 millions was

[1] Commercial broadcasts from Radio Luxembourg and from "pirate" off-shore transmitters have been in operation for many years.

spent, representing only 41 per cent of total classified advertising. [1]

A multiple regression equation again based on year-by-year changes was found to explain 70 per cent of variations in classified advertising over the period 1961-1975 :-

$$^{\Delta}\text{Log}_e C = \underset{(2.54)}{4.12}\,{}^{\Delta}\text{Log}_e\,\text{GDP} - \underset{(1.93)}{0.238}\,{}^{\Delta}\text{Log}_e\,U - 0.042$$

$R^2 = 0.70$ D.W. = L.75

t values are shown in parenthesis

U = % rate of unemployment

C = expenditure on classified advertising

(Collinearity between the independent variables (r = 0.64) reduces slightly the predictive reliability of this equation ; it also explains the rather hig h standard error for the second independent variable.)

The volatility of advertising in relation to economic changes is a continuing element in the newspaper environment. The decline in the real value of advertising expenditure between 1973 and 1975 is undoubtedly a major cause of the sharp decline in the real value of newspaper and general publishing profits between these two years. With a recovery in the economy, both display and classified advertising would probably rise sharply.

The prices charged for advertising ("media rates") are also sensitive to economic conditions, so that variations in advertising expenditure are not fully reflected in the volume of advertisements. Published indices for the Press do not take into account any privately negotiated discounts but it is clear from evidence presented by the Royal Commission that competition to sell advertising space, between newspapers and also between the Press and other media depressed media rates in 1974 and 1975. The Commission estimated that in 1975 some newspapers were selling advertising space at a loss, in cost. This calculation takes into account the need for publishers to maintain a balance between advertising and editorial material - the sale of more advertising space may mean the need for more editorial matter, with additional costs of paper and printing.

3. Trends in Circulation

(a) Newspapers

There is much more information available in collated form about the circulation of newspapers than about that periodicals. Table II-4 shows the total for each category of average circulation per issue in January to June of each year listed :

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[1] Royal Commission on the Press : Final Report 1977, paragraphs 5-28 and 5-29.

Table II-4 Newspaper Circulation 1968-75 (000's)

	1968	1970	1973	1975
National dailies	15,263	14,868	14,549	14,322
Regional dailies	10,511	10,318	9,954	9,770
National Sundays	24,177	23,691	22,017	20,772
Regional Sundays[1]	3,262	3,171	3,123	3,041
Local weeklies	13,337	12,994	12,730	12,276

Source : Press Council annual reports.

Table II-4 shows a decline in circulation in all five categories. In percentage terms the decrease over the entire period for each category was as follows :-

National dailies	6.1
Regional dailies	7.0
National Sundays	14.1
Regional Sundays	6.8 (approximation only)
Local weeklies	8.0

The total population of the United Kingdom increased by 1.6 per cent over the seven year period and the decreases represent reduced purchases per person and per household. A number of factors have contributed to this decline :-

(i) An increase in the prices of newspapers in relation to the general level of living costs. Whereas the general cost of living at the first quarter of 1976 was 2.51 times that of ten years earlier, for national daily newspapers the corresponding ratio was 4.37 and the price increases for other newspapers were fairly similar. The increased prices of newspapers reflected substantial increases in the costs of newsprint and ink (the largest cost components), aggravated by currency depreciation. This is probably the most important factor.

(ii) Changes in working hours and in the hours of television transmission which have enabled people to see television news programmes in the early evening. This has affected evening papers most severely but there has also been some effect on morning papers.

(iii) Greater use of motor vehicles for travelling and especially commuting.

(iv) Increasing competition from local radio, operated by the BBC from 1962 and by commercial radio companies from 1973.

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1 An estimate has been made of the circulation of the Sunday Post(Glasgow) by reference to the National Readership Survey. The owners do not publish the circulation.(see overleaf) We extended the analysis to specialist periodicals. Among trade, technical distinguished

(b) Periodicals

Circulation data for consumer magazines have been partly collected by Reed International Ltd (IPC) and have been published by the Royal Commission[1] Total sales appear to be very sensitive to economic conditions :-

Table II-5 Gross Annual Circulation of Consumer Magazines

(milliona)	1965	1970	1973	1975
General interest	985	935	975	871
Adult women's	560	493	487	457
Young women's	47	77	74	65
Teenage	87	84	178	80
Children's	482	518	446	329
	2160	2108	2160	1802

A further sharp decline in sales of general interest magazines appears to have occurred in 1976.[2]

Circulation of some of the major journals of opinion (the Listener, Spectator, New Statesman, etc.) has also fallen sharply in recent years and some large specialist magazines, concerned with motor cars, household maintenance and hobbies have also shown a decline.

Periodical publishing is a very competitive activity with a high rate of "births and deaths" (launches and closures). In the consumer magazine sector no fewer than 830 new titles were launched in the years 1968 to 1974 and there were 700 closures. The total number of titles at the end of 1974 was about 1,200.

We extended the analysis to specialist periodicals. Among trade, technical and professional publications there are equally remarkable birth and death rates. The total number of titles at tbe end of 1974 was 3,283 ; over the previous seven years 1,107 titles had been born and 859 had died. The 1961-2 Royal Commission on the Press commented that periodicals were "much more ephemeral than newspapers. They cater for constantly changing fashions and habits and they come and go with frequency which, if it were found in the newspaper press would indicate an alarming instability.(1)

As will be demonstrated in sub-section H below, the publishing of periodicals as a whole is more highly concentrated than most other sections of the Press. Most of the titles included in the figures of births and deaths were produced by smaller companies, some of them perhaps aiming to take advantage of a market which they recognised as ephemeral.

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[2] See Royal Commission on the Press : Research Series 6 - Periodicals and the Alternative Press Cmnd. 6810-6 (HMSO)

(1) Royal Commission on the Press 1961/2 Report, Cmnd 1811, 1962, paragraph 13.

B. MORE DETAILED ANALYSIS OF NEWSPAPERS BY CATEGORY

1. National Dailies

The following newspapers were included in this category in 1968 and 1975 :-

Table II-6 National Daily Newspapers 1968 and 1975

Average circulation per issue (1000's) *

		1968	1975	1975 circulation as % of 1968
Daily Express	(P)	3853	2894	75
Daily Mail	(P)	2095	1730	83
Daily Mirror	(P)	5034	4018	80
Daily Sketch	(P)	915	closed	-
Daily Telegraph	(Q)	1407	1353	96
Financial Times	(Q)	156	186	119
Guardian	(Q)	281	336	119
Morning Star		55	43	78
Sun	(P)	1066	3435	322
Times	(Q)	401	327	82
		15263	14322	94

* Circulation figures are based on the first half of each year and are obtained from Press Council annual reports.

The Royal Commission on the Press sub-divided the national daily newspapers into two groups- the popular dailies (marked P in Table II-6) and the quality dailies (marked Q)[1] .

The differences between these two categories in terms of intellectual appeal or education and social class of readers are by no means clear-cut. For example, of people whose education finished at the age of 19 or over (mostly university graduates) 19 per cent read the Daily Express regularly and 15 per cent read the Daily Mirror, while the Guardian and the Times were read regularly by 16 and 13 per cent respectively. On the other hand, under 5 per cent of those whose education ended at 15 or less read any of the four quality dailies.[2]

Besides their smaller circulation and more limited appeal, three other features distinguished the "quality" from the "popular" dailies (i) the relative importance of advertising and sales of copy as a source of revenue (ii) their higher prices and (iii) their greater size.

(i) In 1973, at the peak of the advertising boom, 70 per cent of the revenue of the four quality dailies was derived from advertising, mainly classified ; for the four popular dailies then published the proportion was 36 per cent. In 1975 the two corresponding proportions were 58 and 27 per cent. The quality newspapers have occasionally emphasised their role as advertising media in publicity aimed at potential readers.

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1 The Morning Star, the official organ of the British Communist party cannot easily be assigned to either category.

2 Source : National Readership Survey 1974-5 (JICNARS)

(ii) Partly because of their smaller circulations and consequently higher unit costs, partly because of their greater size, the quality newspapers are more expensive. At the end of 1975 cover prices were as follows :-

Daily Express	6 pence	Daily Telegraph	7 pence
Daily Mail	6 pence	Financial Times	10 pence
Daily Mirror	5 pence	Guardian	10 pence
Sun	5 pence	Times	10 pence

(iii) The average number of standard pages[1] in each newspaper in 1974 was as follows :-

Daily Express	16.8	Daily Telegraph	30.9
Daily Mail	17.2	Guardian	23.2
Daily Mirror	13.1	Financial Times	33.7
Sun	13.5	Times	30.0

Source : Royal Commission : Interim Report Cmd. 6433, 1976

Over the survey period the total circulation of the quality newspapers declined from 2.245 millions in 1968 to 2.202 millions in 1975 ; that of the popular newspapers declined from 13.018 millions to 12.120 millions between the same years.

In 1968, the Daily Mail and General Trust Ltd., owned two popular dailies - the Daily Mail and the Daily Sketch. The Sketch closed in 1970. The other company with two national dailies was the International Publishing Corporation Ltd., which owned the Daily Mirror and the Sun. The latter of which had earlier been the Daily Herald was threatened with closure in 1969 when the title was acquired by the Australian-controlled company, News of the World Organisation Ltd., (now News International Ltd.). The International Publishing Corporation merged later in 1969 with Reed Ltd., to form Reed International Ltd. After the demise of the Sketch and the re-emergence of the Sun under new ownership, each of the national dailies is now separately owned with no significant financial links between owners.

The redesigned Sun newspaper is much more competitive with the Daily Mirror than its predecessor. A tabloid, with emphasis on "light" material and photographs, the circulation of the Sun trebled over the first three years of its redesign. The battle for sales with the Daily Mirror is a major feature of competition in the newspaper industry.

The term "national" is here used to describe newspapers with circulation throughout the United Kingdom. In Scotland and Northern Ireland sales of U.K. papers are smaller than those of newspapers published in those two parts of the U.K. Scotland may indeed be

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[1] A standard page contains 2540 cm^2 and is roughly equivalent to one broadsheet page or two tabloid pages.

regarded as having its own national newspaper market. IPC (now Reed International), the Thomson Organisation (owners of the Times) and, until 1975, Beaverbrook Newspapers Ltd., all puboished separate newspapers in Scotland which were similar to their English counterparts.[1]

2. National Sundays

For the same reasons and on the same criteria as with the national daily newspapers, the national Sundays are classified into "popular" and "quality" categories. Table II-7 lists the titles, shows the categorisation (P or Q) of the Royal Commission and also circulation in 1968 and 1975.

Table II-7 National Sunday Newspapers 1968 and 1975

Average circulation per issue (000's)

		1968	1975	1975 as % of 1968
News of the World	(P)	6919	5560	80
Observer	(Q)	903	761	84
People/Sunday People+	(P)	5533	4219	76
Sunday Express	(P)	4238	3786	89
Sunday Mirror	(P)	5138	4284	83
Sunday Telegraph	(Q)	713	757	106
Sunday Times	(Q)	1461	1396	99

* Circulation fig ures are the average per issue in the first half of each year and are taken from Press Council annual reports.

\+ Change of title only

The three "quality" papers are distinguished from the other national Sunday newspapers by their more limited appeal - fewer than 5% of those whose education ended at 15 (who themselves represent 67 per cent of the total adult population) read any one of the three. They also derive a much higher proportion of their total revenue from advertising (74 per cent compared with 38 per cent for popular Sundays in 1973 ; 66 compared with 31 per cent in 1975). They are dearer to buy and they are much bigger, although much of the extra space is taken up by advertising, for which the largest paper (the Sunday Times) is bought by many of its readers.

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[1] Circulation of the Scottish Daily Express has been included with that of the Daily Express throughout this section.

The decline in sales of Sunday newspapers may be partly due to a sharp increase in cover prices during the period 1970-6 when the prices of some papers more than trebled. On the other hand, the comparative changes in circulation do not reflect comparative changes in prices. It is possible that changing social habits and the greater coverage of news on television have also contributed to the decline of the reading of newspapers on Sundays.

Of the titles listed, Reed International (via the subsidiary International Publishing Corporation) own the Sunday People and the Sunday Mirror ; News International Limited own the News of the World ; Beaverbrook Newspapers Ltd., own the Sunday Express and the Thomson Organisation, the Sunday times. The Sunday Telegraph was introduced in the early sixties to complement the Daily Telegraph. The Observer is the only Sunday newspaper without an associated national daily.

Note on the Regional Coverage of National Newspapers

Before going on to describe the regional press, it is important to emphasise that regional variations are included in the content of national newspapers. All of the popular dailies except the Sun are published in Manchester as well as London as also is the Guardian. All Sunday newspapers except the Observer are published in the two cities. The northern editions vary, sometimes considerable, from the London editions in terms of coverage of regional news. Even in different editions from the same printing works, local variations are included. The writer has read widely different accounts of the same football match by buying two copies of the same newspaper issue, in the home town of each of the two opposing sides !

3. Regional (or Provincial) Dailies

These include morning and evening newspapers. The distinction is important because morning regional newspapers tend to cover larger areas than their evening counterparts, which tend to be confined to specific large or medium-size towns and their suburbs. The regional morning press also tends to resemble the "quality" rather than the "popular" national dailies, in its appeal and format. Another interesting difference is that a higher proportion of copies of morning papers are delivered to homes.

Examples of the difference in areas covered are provided (i) by the morning Liverpool Daily Post, which sells throughout West Lancashire, Cheshire, the Isle of Man and North and mid-Wales (60% of sales are in Wales), compared with its sister evening paper the Liverpool Echo which sells mainly in Liverpool and the Merseyside conurbation ; (ii) by the Yorkshire Post which sells throughout northern England and the sister Yorkshire Evening Post which is essentially an evening paper for the Leeds area.

London evening papers are sometimes classed as part of the national press because both were regarded as sister papers to national dailies :- the Evening Standard was, until mid-1977, 'produced by Beaverbrook Newspapers at the same premises as the Daily Express ; the Evening News is produced by the Daily Mail group. This classification does not reflect the newspapers" geographical coverage, which is becoming increasingly confined to Greater London.

Table II-8 shows changes in the circulation of regional morning and evening papers over the period 1968-75, with separate details for major regions.

Table II-8 Combined Circulation of Regional Dailies 1968 and 1975 (000)

Morning	1968		1975		1975 as % of 1968
England and Wales	1004	(13)	905	(12)	90
Scotland	910	(5)	1059	(5)	116
Northern Ireland	115	(2)	122	(2)	106
Total U.K.	2029	(20)	2086	(19)	103
London	2026	(2)	1133	(2)	56
Rest of England	5642	(62)	5519	(68)	98
Wales	282	(3)	267	(4)	95
Scotland	722	(7)	551	(6)	76
Northern Ireland	214	(1)	178	(1)	83
Channel Islands	33	(2)	36	(2)	109
	8899	(97)	7684	(102)	86

Source : Press Council annual reports - circulation data are average per issue in first half of each year.

Notes : Estimated circulations of the Nottingham morning and evening papers have been included.

The numbers of titles are shown in parenthesis

The most dramatic feature of Table II-8 is the decline of the two London evening papers. Among reasons for this are the decrease in the number of people living and working in the central London area ; the launching of new titles in some towns on the fringe of London, such as Watford, Luton, Guildford and Southend ; the early development in London of local radio from the BBC and since 1973 from two commercial radio stations ; the introduction of earlier closing times for offices enabling people to get home to see television news. Similar trends have affected evening newspapers in other conurbations.

The relative importance of regional and national newspapers in different parts of the United Kingdom is discussed in Sub-Section G below.

4. Regional Sundays

These are important mainly in Scotland where two newspapers the Sunday Mail, published by the Reed group with a Jan-June 1975 average circulation of 752,000 and the Sunday Post whose owners (D.C. Thompson Ltd.) state only that its circulation is over one million - we estimate it, on the basis of the National Readership Survey to have been about 1.7 millions in 1975. Other, more local Sunday newspapers, are published in Birmingham, Plymouth, Newcastle-upon-Tyne, and Belfast. A Sunday newspaper launched in the Channel Islands in 1970 did not survive a year and a similar venture on the Isle of Man in 1973 survived only a few months longer.

5. Local weeklies

It is difficult to trace the number of titles or to describe the areas covered because within any area of, for example 400 km^2 there may be an apparently large number of competitive newspapers which are in fact local variations of one basic version, with a good deal of common material.

Local weekly newspapers are essentially vehicles of advertising, which provides over 80 per cent of their sales revenue. Competition from "Free-sheets" which are not included in the circulation data in Table II-4 and from local radio has affected circulation but the general conclusion of the Royal Commission on the Press is that this sector of the Press is likely to show expansion with the recovery of the recruitment, property and automative markets expected to follow from general economic recovery in the United Kingdom over the next few years.

The growing importance of national chains in the publishing of local weekly newspapers is described in Sub-Section D below

C THE DISTRIBUTION OF NEWSPAPERS AND PERIODICALS

In the United Kingdom very few copies of newspapers are distributed by post ; this method (combined with regular subscription) is largely confined to specialist periodicals and learned journals. Most purchasers of newspapers obtain them from retailers, who arrange delivery to homes and/or sell in shops or in streets.

1. Distribution of National Newspapers and Periodicals

About three quarters of all quality papers and over half of the populars are delivered to homes early in the morning.[1] The proportion varies considerably among titles : for example, about 45 per cent of sales of the Daily Mirror are delivered to homes whereas for the Sun the percentage is only around 31.

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[1] Source : The British Newspaper Industry (Jordan Dataquest Ltd., 1976)

The publishers arrange and cover the cost of transport from the two publishing centres, London and Manchester, to warehouses of wholesalers. The wholesalers handle all but a very small percentage of national newspapers. Distribution is mainly by rail and some sorting of newspapers by wholesalers takes place on trains as well as at depots closer to destination retailers. The number of wholesalers' depots is indicated by the fact that the Mirror Group supplies its daily newspaper to 660 such depots[1].

Three firms dominate the wholesaling of national daily newspapers and consumer periodicals - W.H. Smith (Holdings) Ltd., John Menzies Ltd., and Surridge Dawson Ltd., with 36,24 and 8 per cent of the total market.[2] These three firms own over half of the wholesale depots and all three have extensive retail interests. All three have increased their shares of wholesaling through recent acquisitions. John Menzies has a monopoly of newspaper wholesaling in Scotland and is the sole wholesaler in 32 English towns ; W.H. Smith and Surridge-Dawson are the sole wholesalers in 22 and 23 towns (respectively) in England and Wales.

The wholesaling of national Sunday newspapers is handled by a largely separate system with some direct supply to small retail agents. The retail outlets of the big three wholesalers are, for the most part, closed on Sundays and their involvement in the distribution of Sunday newspapers is much less. There may be as many as 5,000 independent wholesalers or wholesalers/retailers of Sunday newspapers.

2. Distribution of Provincial Newspapers

The pattern of distribution of provincial newspapers was estimated by the recent Royal Commission as follows :-

Table II-9 Distribution of Provincial Newspapers 1975-6

	Morning dailies	Evening dailies	Weeklies
Average percentaged delivered via			
Wholesalers and retailers	62	1	25
Retailers direct	38	91	72
Newsvendors (street)	negligible	4	1
Direct delivery	"	4	2

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[1] Royal Commission on the Press, 1974-77, Appendix F, paragraph 8.

[2] Ibid., para. 9.

The table shows the difference between the evening newspaper, where fast delivery is important in ensuring the attractiveness of the product, and the morning newspaper where there are a few hours to spare. Another reason for the greater proportion of direct delivery of evening newspapers is that the area covered is smaller[1] and the quantity supplied to any individual retailer is greater.

Weekly newspapers normally have a high penetration in a limited area with a high proportion of delivered copies.

The proportion of copies of provincial evening newspapers delivered to homes is surprisingly high. Evidence given to us by two major publishers of evening newspapers in widely separated parts of the country showed the percentage to be 60 per cent in one case and 70 per cent in the other.

3. Newspaper Retailers

In 1971 there were 32,566 shops in the United Kingdom selling newspapers and periodicals[1]. Of these about 85 per cent are owned and run by one family[2] but national and regional chains of newsagents have extended in recent years and the three large wholesalers have also increased the numbers of their retail outlets.

Some publishers of provincial newspapers have acquired newsagent shops, some of them not identified by name with the publisher. Individual companies have pioneered this development. Discussions regarding the reasons for this forward intergration suggest that, while it may have been partly motivated by the desire to guarantee security of outlet, this is no longer a prime consideration. Retail newsagents normally sell confectionery, tobacco, stationery and a range of other goods. By developing this range newspaper companies may be able to promote the casual sales of their papers and by promoting newspapers may be able to increase casual sales of other products. Newsagents' shops offset the volatility of advertising revenue.

The newspaper companies with whom we discussed the matter said that management of the shops was kept distinct from that of newspapers and that competitors' publications were supplied on the same basis as the company's own. One company with no shops reported that ownership of outlets by its competitors did give them trading advantages over it in dealings with other retailers. Such competitors were better able to restrict suppliers to such retailers and could use this as a threat to secure promotion of their publications.

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[1] Census of Distribution 1971 quoted in ibid., paragraph 13

[2] National Federation of Retail Newsagents

4. Distribution Margins

Although resale price maintenance is illegal in the United Kingdom, and no exemption has been made by the Restrictive Practices Court with respect to newspapers and periodicals, newspapers are almost without exception sold to the final customer at the publishers' recommended prices. One reason for the absence of discounts by retailers is the practical impossibility of a small percentage cut in the retail margin, on a newspaper. For example, on a newspaper with a cover price of 6p the retail margin would be 1.68p - to reduce the price to 5p would imply a reduction of nearly 60 per cent of the margin.

However, discussions in the industry suggested to us that de facto collective agreements exist between national associations of publishers (the Newspaper Publishers Association and the Periodical Publishers Association) and those of retailers and wholesalers. Retail margins of national newspapers are uniformly 28% - an attempt by the Mirror Group to reduce the margin by 1 per cent in 1968 led to boycotting by newsagents. The Restrictive Practices Court declared this boycott to be illegal but the Mirror Group ultimately was forced to restore the former margin.

Wholesale margins average about 8 per cent of final price with some variation according to the amount of sorting undertaken by the wholesaler and the publisher.

For the provincial press average wholesale margins are 8 per cent of cover price and those of retailers around 29 per cent. Variation is slightly greater for weekly papers than for dailies.

D. THE STRUCTURE OF THE NEWSPAPER AND PERIODICAL PUBLISHING INDUSTRY

1. Selection of Sample

The Census of Production 1968 listed 715 enterprises in the United Kingdom as engaged in this industry. This total included 548 firms with fewer than 100 enoloyees and obviously producing only one or two titles with limited circulation. At the other extreme, 32 companies accounted for 76 per cent of employment and 83 per cent of value added in the industry.

For the purposes of this study we have included all the 35 publishers of newspapers and periodicals who were included in the EAU analysis for total publishing, described in Section I[1] . These accounted for 94.2 per cent of the annual circulation of newspapers in the United Kingdom in 1975 compared with 91.8 per cent in 1968. For periodicals

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[1] See page 16 above.

the coverage is lower, at about 70 per cent, partly because of the large number of small independent periodicals but partly also because of periodicals published by non-commercial organisations, such as the British Broadcasting Corporation. The accounts of these organisations are not published in sufficient detail to facilitate calculation of turnover and profits derived from publications.

The total value of sales turnover from printing and publishing of newspapers and periodicals of the firms within our sample was £ 1009.7 millions in 1975, equal to 93.7 per cent of the estimate by the Business Statistics Office of Press Turnover from firms with at least 25 employees. (presented in Table II-1 above). For 1968 the coverage was 91.6 per cent. The concentration indices presented below relate to the sample of firms not to the total population.

Table II-10 presents a list of the firms in the sample and shows the U.K. circulation of their newspapers in each of the following categories :- national dailies, national and regional Sundays, regional dailies and local weeklies.[1]

Table II-10 also shows our own calculation of the retail value of their sales of periodicals during 1975. For any one periodical, annual retail sales value is calculated as follows :- (the average circulation per issue) times (the average retail price per issue) times (the number of issues in the year). For the enterprise with more than one periodical the total figure is simply the sum of the annual retail sales values of individual titles. The use of annual retail sales value instead of circulation overcomes the problem of comparison of periodicals costing as much as 75p with those costing as little as 10 p.

The final column in Table II-10 is the value of turnover obtained from the printing and publishing of newspapers and periodicals, including advertising revenue. In most cases this has been derived directly from the published accounts of the company concerned ; in the case of three smaller companies whose 1975 accounts had not yet been filed with the Registrar of Companies we were forced to estimate turnover on the basis of 1974 figures and subsequent changes in circulation.

2. Approach to Analysis of Concentration

From Table II-10 the different emphasis of individual large companies can be observed.

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1 Circulation data obtained from the following sources :-

Press Council Annual Report 1975
Royal Commission 1974-77 Final Report Appendix A
Newspaper Press Directory 1975

The circulation of the (Glasgow-based) Sunday Post is estimated as explained on page 66.

TABLE II-10 List of Firms in the Press Sample (page 1)

Name of ultimate holding company	Combined circulation per issue of newspapers 1975				£000's	
	National dailies	Nat.& Regional Sundays	Regional dailies	Local weeklies	1975 Retail Value of Periodicals	Total turnover from Press 1975
Beaverbrook Newspapers Ltd.	2,894	3,786	485	22	-	80,565
Benn Bros. Ltd.	-	-	-	-	2,075	5,643
BPM Holdings Ltd.	-	231	606	238	-	15,929
Bristol Evening Post Ltd.	-	-	221	96	-	8,304
British Electric Traction Ltd.	-	-	-	221	3,970	12,300
Conde Nast Publications Ltd.	-	-	-	-	1,600	4,269
County Newspapers Ltd.	-	-	-	263	-	4,631
Daily Mail & General Trust Ltd	1,730	-	1,641	488	8,360	83,428
Daily Telegraph Ltd	1,353	757	-	-	*	46,443
D.C. Thomson & Co. Ltd.	-	1700	188	-	13,230	28,172
Eastern Counties Newspapers	-	-	237	125	-	8,677
East Midlands & Allied Press	-	-	76	207	3,498	10,440
Economist Newspapers Ltd	-	-	-	-	3,458	5,821
Forman Hardy Holdings Ltd	-	-	147	-	-	6,155
Guardian & Manchester Evening News Limited	336	-	386	-	(small)	25,270
Haymarket Review Ltd.	-	-	-	-	4,282	10,070
Ind. Television Pubs. Ltd.	-	-	-	-	16,723	14,624
Kent Messenger Ltd.	-	-	42	(small)	-	6,813

TABLE II-10 List of Firms in the Press Sample (page 2)

Name of ultimate holding company	Combined circulation per issue of newspapers 1975				£000's	
	National dailies	Nat.& Regional Sundays	Regional dailies	Local weeklies	1975 Retail Value of Periodicals	Total turnover from Press 1975
Link House Holdings Ltd.	-	-	-	-	4,000	8,680
Liverpool Daily Post & Echo Ltd.	-	-	413	172	-	14,017
Macmillan Ltd.	-	-	-	-	1,200	2,016
Midland News Assocn. Ltd.	-	-	332	90	-	10,899
Morgan Grampian Ltd.	-	-	-	-	6,824	11,097
News International Ltd.	3,435	5,560	37	294	162	26,685
Observer Holdings Ltd.	-	761	-	-	*	9,647
Portsmouth & Sunderland Nprs.Ltd.	-	-	223	71	-	5,910
Reed International Ltd.	4,018	9,324	627	45	74,000	232,631
Scottish & Univ. Investments Ltd	-	-	351	343	-	19,683
Southern Newspapers Ltd.	-	-	187	73	-	8,255
S. Pearson & Son Ltd.	186	-	686	1,272	385	71,385
Thomson Organisation Ltd.	327	1,592	1,495	393	5,448(*)	115,000
United Newspapers Ltd.	-	-	784	297	1,702	31,649
Yattendon Investment Trust Ltd.	(included with BPM Holdings - see text)					
Not included in Enterprise Tables of Section I						
F. Johnston & Co. Ltd.	-	-	-	223	-	2,400
St. Regis Newspapers Ltd.	-	-	79	84	-	2,860

* = not including supplement to Sunday newspaper

The Reed International is by far the largest company with widespread interests. It is important in newspapers, mainly through large-circulation popular papers like the Daily Mirror (its national daily) ; the Sunday People, the Sunday Mirror, the Glasgow-based Sunday Record and the smaller Plymouth Independent which together enable it to predominate in Sunday newspapers. Its only "regional" daily is the (Scottish) Daily Record, by far the most popular daily paper in Scotland. Its only involvement in local weekly newspapers is in the rural areas of South Devon. The Reed subsidiary, International Publishing Corporation[1] accounted for exactly half of the periodicals published by our sample companies and, since this sample accounted for about 70 per cent of the total periodicals market this means that its share of the total was around 35 per cent.[2] This estimated share is consistent with the Royal Commission's own assessment,[2] which was made simultaneously with, but completely independently of our own research. In terms of total turnover from newspapers and periodicals, Reed International obtained a 23.0 per cent share of the market in 1975, compared with 29.8 per cent in 1968.

Although Reed is a leading company in most sections of the Press (except local weeklies) this is not true of the other companies and it is more meaningful to discuss competition in the context of product markets.

For national daily and for Sunday newspapers the competitive situation has already been described on pages 61/63 above.

From Table II-10 it is possible to identify the companies with the greatest involvement in regional daily newspapers. In regional dailies these are the Daily Mail group, the London Evening News and thirteen evening papers in the East Midlands, S. Wales and the West Country, in addition to the Thomson Organisation (strongly represented in Scotland, Northern Ireland, S. Wales and in certain distinct areas of England).

The other leading companies are also strongly concentrated in a number of separate parts of the United Kingdom and it is more fruitful to discuss concentration by region, which we do in Sub-Section F below, where concentration indices are applied to each of six regions.

The publishing of local weekly newspapers remains the most atomistic section of the industry although some enterprises, especially Westminster Press (subsidiary of S. Pearson), News Internation, Scottish and Universal Investments have extended their ownership substantially

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1 See "Periodicals and the Alternative Press" Research Series 6 Cmnd. 6810-6 (1977) paragraphs 42 to 47.

2 During 1977 the name of this subsidiary has been changed to the Reed Publishing Group Ltd.

in recent years and this has been the subject of investigation by the Monopolies and Mergers Commission. This market segment is analysed in greater detail in Section G.

We have already pointed to the dominant position of Reed in the supply of periodicals. This is analysed further in Section H, where concentration indices are applied to the penultimate column of Table II-10.

3. Links between Companies in the Sample and Interests in Small Press Companies

Although not more than 50 per cent of the equity of any of the 35 companies in our sample is owned by any other company within or outside the sample, there are several financial ties between the 35 firms.

First, a majority of the equity capital of two of the companies, BPM Holdings Ltd. (the holding company for The Birmingham Post and Mail Ltd., and three weekly newspaper subsidiaries) and Yattendon Industrial Trust Limited (which through its subsidiary Coventry Newspapers Ltd., publishes evening newspapers in Coventry and Cambridge and weeklies in Cambridgeshire) is owned by one family, that of Lord Iliffe. Members of the family are on the boards of both companies and there is another common director. Outside our sample, BPM Holdings hold 25% of the equity of North Wales Newspapers Ltd., a publisher of one evening paper and nine weekly newspapers in Wales. One director of BPM Holdings Ltd., also sits on the board of North Wales Newspapers Ltd.

S. Pearson and Son Ltd., through its subsidiary Westminster Press Ltd., held 28.3 per cent of the BPM Holdings Ltd. Two of the directors of Westminster Press were on the board (of seven) directors of BPM Holdings Limited, one of them the Chairman of Westminster Press. This holding and representation existed throughout the period 1968-75. S. Pearson and Son also owned, through its subsidiary the Financial T imes Ltd., 49.9 per cent of the Economist Newspaper Ltd., another firm in the sample ; and shared with Reed International the equity of Throgmorton Publications Ltd., publisher of the three weekly journals for investors. Through its Westminster Press subsidiary it also has a 59.8 per cent holding in Catholic Herald Ltd., publisher of a weekly national newspaper for Roman Catholics.

The Daily Mail and General Trust Ltd., controls (by 50.6 per cent equity holding) Associated Newspapers Group Ltd. (to which our sample figures relate) which in turn has a 23.5 per cent holding in Bristol Evening Post Ltd., another firm in our sample.

These and other holdings by companies in the sample in other newspaper or periodical publishers are listed below :-

Name of ultimate parent (A) (included in the sample)	Partly-owned companies (S=another sample co.) Name	% of equity held
British Electric Traction Company Ltd.	United Newspapers Ltd. (S)	5.7
Daily Mail and General Trust Ltd.	Bristol Evening Post Ltd. (S)	23.5
	Reading Newspaper Co. Ltd.	32.5
BPM Holdings Ltd.	North Wales Newspapers Ltd.	25
Liverpool Daily Post and Echo Ltd.	All leading newspaper companies in England	< 1
S. Pearson and Son Ltd.	Economist Newspaper Ltd. (S)	49.9
	BPM Holdings Ltd. (S)	28.5
	Throgmorton Publications Ltd.	50.0
	Catholic Herald Ltd.	49.8
Reed International	Throgmorton Publications Ltd.	50.0
	Several smaller periodical companies	

In the analysis of concentration we have recognised the practice adapted by Companies Acts in the U.K., whereby companies declare in sales turnover in consolidated accounts the total sales of all subsidiaries in which they have a controlling interest (greater than 50% of the vote - entitling equity). Net profits before tax, however, include income from minority holdings. With the terms of reference prescribed by the Commission and with current practice of financial reporting in the U.K., we were unable to avoid the double-counting of those profits made by one company in our sample which were then remitted to another as dividents.

The double-counting is confined to less than 2 per cent of combined profits.

4. Competitive Media and Investment in them by the Press

Another activity may be said to compete with the press in either or both of two respects:-

(i) as a medium of communication of news, information, opinion or entertainment

(ii) as a medium for advertisement.

The government radio and television services, compete mainly in respect (i) ; hoardings and transport companies with advertising on vehicles compete only in respect (ii) commercial television and radio are the main media which compete in both respects.

(a) Television

By the end of 1975 there were 17.4 million television licences current in the U.K., [1] which

[1] A television licence entitles a household to operate at least one television set.

means that 90 per cent of households hold a TV licence. Surveys have shown that average viewing time per head of population exceeds 15 hours per week.[1]

The British Broadcasting Corporation transmits two national networks, one of them BBC2 includes no regional variations and is used for educational broadcasts and more serious programmes ; the other (BBC1) has variations for eleven regions in news and current affairs programmes. In Northern Ireland, Scotland and Wales, variations from the London broadcast are quite extensive, especially in Wales. Only a few remote and mountainous regions are now out of range of BBC television transmitters.

Commercial (or "independent" television was introduced in 1955. It comprises 15 regional programme companies under contract to the Independent Television Authority which allocates transmitters. The ITA has now become the Independent Broadcasting Authority. A public body, it is responsible for surveillance over commercial television and radio. News of regional level is provided by the programme company and coverage of national and international news is provided by Independent Television News Ltd., jointly financed by the programme companies. IBA transmitters have a widespread coverage similar to that of the BBC and, in general, independent television attracts wider average audiences than the public network. Regional news coverage is also similar to that of the BBC.

(b) Radio

There are four national radio networks, two of which combine during certain periods of the day. All four are operated by the BBC. BBC Radios 1 and 2 respectively broadcast modern "pop" and light music with regular short hourly bulletins of news and other information (weather reports etc.). Only one of these alternatives is broadcast at any one time by the allocated network of Very High Frequency transmitters and, the AM transmissions are not universally receivable.

BBC Radio 3 carries serious music and other "minority interest" programmes, mainly on VHF but with a medium-wave transmitter in central England and another medium-wave relay in central Scotland.

BBC Radio 4 in England has become a national news and current affairs network, most of its programmes are devoted to news bulletins,discussions and documentaries. Scotland, Wales and Northern Ireland each has its own substitute for Radio 4 (Radio Scotland etc.) which carries many Radio 4 programmes but devotes as much as 50% of time to more local material. The VHF transmitters allocated to Radio 4 and its non-English equivalents are used for regional broadcasts.

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[1] Britain 1974 : An Official Handbook (HMSO), page 21.

The BBC has 20 local radio stations in England ; the first eight were opened in 1967. These broadcast programmes of local interest for as much as 12 hours per day - at other times they broadcast one of the national networks. Most relay the major news bulletins from Radio 4. Those local transmissions usually have a range of 40 miles, on VHF and common AM frequencies.

Local commercial radio began in the United Kingdom in 1973 and by 1975 there were 13 commercial radio stations again broadcasting from low-power transmitters, using VHF and common AM frequencies. They share a national news service (Independent Radio News) and, as well as popular music, broadcast a fairly large volume of local news, information and discussion.

To illustrate the news broadcasts available on television and radio let us take a man in Swansea, South Wales at 1730 hours on a weekday. Within 90 minutes he has the following news programmes available :-

BBC Wales :	National BBC Television News (from London). General and Welsh regional news in Welsh. Welsh Regional news in English.
Independent Television: (regional)	Independent Television News (from London). General and Welsh regional news in Welsh. Welsh regional news in English.
BBC Radio 1 :	News summary
BBC Radio 2 :	" "
BBC Radio 3 :	" "
Swansea Sound :	General news (from IBN in London). Local news in English. Local news in Welsh.

In spite of this abundance of news on radio and television, Swansea's evening newspaper has maintained its circulation over the eight years to 1975.

(c) Involvement of the Press in Commercial Television and Radio

The Royal Commission on the Press of 1961-2 regarded control of a television company by a single newspaper company (the Thomson organisation then owned 80% of Scottish Television) as contrary to the public interest, but did not oppose minority holdings.[1] This new was shared by the government appointed Pilkington Committee on Broadcasting which reported in 1960. The Television Act 1964 empowered the Independent Television Act (with the approval of the Home Secretary) to terminate a programme contract if it believed that the public interest was threatened by newspaper shareholdings.

The ITA required Thomson to reduce its holdings in Scottish Television to 25 per cent by 1968 and, although the statutory power as such has never been used, the threat of it is a brake on further press control of television contractors.

The Independent Broadcasting Authority Act of 1973 required (i) that the owners of any newspaper with extensive circulation in an area and/or of which the financial position would be materially worsened must be offered a shareholding by any company proposing to establish local commercial radio in that area.

(ii) that no newspaper company with substantial local circulation should have a controlling interest in a local radio station. (The IBA has interpreted this to mean 12½% for a newspaper with a monopoly of local news but allows bigger percentages for national newspaper groups).

Holdings by newspaper publishers in commercial television and radio stations at 30 June 1975 are listed in Appendix B.[1]

The largest single holding by any major company which publishes newspapers is that of British Electric Traction (via its subsidiary Rediffusion Television Ltd.) in Thames Television Ltd., the London region Monday-Friday contractor. BET's holding is 50 per cent of the equity - 49.99 per cent of voting shares and 50.02 per cent of non-voting. Although its weekly newspapers account for about 10 per cent of the circulation of weekly newspapers in the area served by Thames Television, it has no financial interest in local or national daily papers and is not regarded by the IBA as a newspaper publisher for the purposes of the restrictive legislation.

Other individual press holdings in excess of 20 per cent of the voting equity of commercial television companies are :-

Anglia Television :	Guardian and Manchester Evening News Ltd.(20.9 per cent.)
Associated Television :	Reed subsidiaries (29.6 per cent)
Border Television :	Cumbrian Newspapers (23.8 per cent) (non-sample company)
Scottish Television :	Thomson Organisation (25.0 per cent)
Southern Television :	Daily Mail & General (37.5 per cent) D.C. Thomson (25.0 per cent)

Excluding the BET holding the total holdings by all press companies of the total equity of commercial television contractors in 1975 amounted to 18.0 per cent, of which 17.2 per

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[1] Source : Press Council Annual Report

cent was held by companies in the sample. When British Electric Traction is included, the percentage rises to 25.5.

In commercial radio press holdings mounted to 23.6 per cent of total equity, of which 18.8 per cent was held by companies in the sample. When BET's indirect holdings in Capital Radio are included, the percentage rises again to 25.5.

Loan capital has also been supplied by Press Companies to commercial television and radio, in approximately the same proportions as equity investment.

E. ANALYSIS OF NATIONAL CONCENTRATION

In sub-section (1) are presented the analyses of concentration, using the standard indices of the Commission for turnover and profits from the printing and publishing of newspapers and periodicals in 1968, 1973 and 1975. An analysis of the national circulation of newspapers in 1968 and 1975 appears in sub-section (2).

1. Analysis of Turnover and Profits

Table II-11 shows the total value of turnover, profits excluding losses and profits plus losses for the sample of press companies in 1968, 1973 and 1975. The total turnover of the sample is also shown as a percentage of the value of Press turnover published by the Business Statistics Office.

The factors which have influenced sales turnover, especially the drop in advertising since the peak in 1973 were discussed in sub-section A above. The rise in the real value of profits between 1968 and 1973 and the subsequent sharp decline demonstrate the consequences of volatility of sales revenue for companies with a high proportion of fixed costs. A newspaper proprietor can reduce output only to a limited extent : the sharp drop in advertising means an inevitable decrease in sales revenue per issue and per copy sold.

Table II-12 shows the values of the concentration indices for sales turnover and profits in each of the three years.

(a) Sales Turnover (01)

In 1968 the Linda analysis shows the existence of an oligopoly group of seven enterprises which together accounted for 76.7 per cent of total turnover. The largest single firm was the International Publishing Corporation (during 1969 this was acquired by Reed International) with 29.8 per cent of total turnover followed by the Thomson organisation with 13.5 per cent. Other members of the oligopoly group were, in order, the Daily Mail group, Beaverbrook Newspapers, Daily Telegraph, S. Pearson and News International.

Table II-11 Total Value of Turnover and Profits - Press Sample

	1968	1973	1975
Variable 01 Sales Turnover			
Number of enterprises	35	35	35
Total value (£ millions)	441.5	757.1	1009.7
Value as % of BSO total	91.6	88.2	93.7
Index at constant purch. power	100	119	110
Variable 04 Net Profits before Tax (Losses EXCLUDED)			
Number of enterprises	33	34	34
Total Value (£ millions)	50.9	77.3	62.9
Index at constant purch. power	100	106	60
Net profits and losses before Tax			
Number of enterprises	35	35	35
Total Value (£ millions)	50.8	77.3	60.4
Index at constant purch. power	100	106	57

The last company held 4.8 per cent of the market, while the next largest company in the industry held only 2.8 per cent.

In 1973 sales turnover was much less concentrated than in 1968. This was partly due to the acquisition of the Sun newspaper by News International[1] but also reflected the gains by companies in the regional press through the greater importance of classified advertising. The relative decline of the popular dailies and of certain consumer magazines was also a factor. The concentration ratio for the four largest companies fell from 61.6 to 49.8 per cent and that for eight companies from 79.5 to 71.9 per cent. The decrease in the Linda index L_8, shows much more equal distribution of turnover among the eight companies. No minimum in the Linda curve occurs until the tenth enterprise, so that the "oligopolistic arena" now contained ten companies, with 77.6 per cent of total turnover. IPC (by then part of Reed International) remained the largest but its market share had fallen to 21.5 per cent. The nine other companies arel Beaverbrook, News International, Daily Mail, S. Pearson, Daily Telegraph, United Newspapers, D.C. Thomson and the Guardian and Manchester Evening News.(2)The three newcomers to the oligopoly group were principally regional newspaper publishers and other enterprises with large regional

[1] See page 62 above

[2] The circulation of the Manchester Evening News was greater than that of the Guardian

Table II-12 Table of Concentration Indices - Press Activities

(EAU-Press)		1968		1973		1975	
		01	04	01	04	01	04
No of firms		35	33	35	34	35	34
Mean value (£000's)		12615	1542	21632	2273	28849	1850
Coeff. of Var.		1.916	1.777	1.485	1.171	1.551	1.320
Gini		0.693	0.671	0.616	0.546	0.624	0.600
Herf. - Hirschman		133.4	126.0	91.6	69.7	97.3	80.7
Entropy		-112.1	-113.6	-123.7	-130.6	-122.1	-125.3
n* = 4	CR	61.6	57.6	49.8	43.9	50.7	49.8
	L	0.544	0.689	0.533	0.383	0.533	0.364
n* = 8	CR	79.5	75.3	71.9	64.3	73.4	70.3
	L	0.437	0.436	0.319	0.291	0.327	0.281
n*h		2	2	2	2	2	2
Ln*h		1.227	1.074	0.874	0.651	1.011	0.560
CRn*h		41.9	42.4	33.9	26.8	34.4	29.9
n*m		7	21	10	6	7	11
Ln*m		0.429	0.283	0.301	0.276	0.327	0.262
CRn*m		76.7	96.7	77.6	57.6	70.3	79.1
LS		0.672	0.445	0.455	0.426	0.559	0.344

For definitions of the terminology see Appendix A or Reference (1)

Variable 01 = Sales Turnover
04 = Net profits before tax

newspaper interests - Thomson, News International and S. Pearson had moved towards the top of the list.

By 1975, with the recession in advertising, concentration increased again but remained less than in 1968. The oligopoly group of seven firms indicated by the Linda index comprised the following :- Reed International (still the largest with its market share recovered to 23.0 per cent), the Thomson organisation, Daily Mail, Beaverbrook, News International, S. Pearson and the Daily Telegraph - the same seven as in 1968 but with changed order. Their share of total turnover was 70.3 per cent and the lower Linda index (and LS) shows much greater equality within the oligopoly group.

(b) Net Profits (04)

In 1968 the ranking of profits and turnover was closer than in subsequent years :-

First eight companies in order of -

Sales turnover	Net Profits - before tax
International Publishing Corporation	International Publishing Corporation
Thomson Organisation	Thomson Organisation
Daily Mail	Daily Mail
Beaverbrook	S. Pearson
Daily Telegraph	News International
S. Pearson	D.C. Thomson
News International	Beaverbrook
D.C. Thomson	Liverpool Daily Post and Echo

The three largest companies accounted for 52.2 per cent of sales turnover and 50.7 per cent of profits. For turnover L_3 was 0.778 and for profits L_3 was 0.867, because the third firm (Daily Mail) achieved a lower margin on sales than the first two. Overall, profits were much less concentrated than turnover in 1968 and in each of the other two years.

In 1973 the ranking of profits and turnover differed considerably :-

First eight companies in order of

Turnover	Net profits
Reed International	Thomson Organisation
Thomson Organisation	S. Pearson
Beaverbrook	News International
News International	United Newspapers
Daily Mail & General	Daily Mail & General
S. Pearson	Reed International
Daily Telegraph	Guardian & Manchester Evening News
United Newspapers	Liverpool Daily Post & Echo

The most remarkable aspect of the column on the right is the relatively high profit-ranking of the companies with extensive interests in regional newspapers. This has already been attributed to the high level of demand for classified advertisements. Overall, profits in 1973 were much less concentrated than in 1968. The Linda index shows a distinct size threshold at 6 enterprises which together accounted for 57.6 per cent of total profits. Within the six the distribution of profits was very even - even though it is the average of only five instead of 20 coefficients, the LS index is lower than that for 1968.

In 1975 the concentration of profits had increased again but it is important to emphasise that some of the largest companies were not among those with the largest profits. The Thomson Organisation, the company with the second largest Press turnover made a loss on its Press activities ; Beaverbrook Newspapers came fourth in order of sales turnover but with a margin of only 2.6 per cent on sales, compared with an average for the sample (including losses) of 6.0 per cent, it was ranked in the ninth position. The seven firms identified as within the "oligopoly" group on sales turnover accounted for 70.3 per cent of turnover and 55.5 per cent of profits.[1]

The financial difficulties of some of the largest concerns has led to changes within the industry since 1975. During 1977 the Beaverbrook newspaper, the Evening Standard (London evening paper) was almost closed and Beaverbrook was acquired by another company, Trafalgar House Investments Ltd. Difficulties within the Reed publishing activities are receiving publicity at the time of writing (November 1977). One of the problems facing the largest, London-based, companies has been the attempt to introduce new labour-saving technology into a declining activity with a predominance of highly-paid skilled labour. The industrial relations history of the Press in recent years has been somewhat stormy and disputes have not been confined to large companies. However, it appears that the large Fleet Street printing houses are less able than most of the smaller provincial companies (or subsidiaries) to avoid disputes and to apply new technology.[2]

2. Analysis of Circulation (Copies Sold)

The published data on newspaper circulation may be used to examine the concentration of communication via newspapers. How many newspapers does each company sell to the public each week.

We have collected data from a variety of sources[3] to establish average circulation per issue of each of the following categories of newspaper in 1968 and 1975 :-

national daily
national and regional Sunday
regional and local weekly
regional daily

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[1] The Thomson loss has not been deducted from the total for the other six, i.e., Thomson's profit is taken as zero.

[2] The industrial relations history is fully described by the Royal Commission 1974-7 in its interim (1976) and final (1977) reports.

[3] Press Council Annual Reports, Royal Commission on the Press, Newspaper Press Directory (Benn), direct questionnaires to companies.

Because magazines and other periodicals are so diverse in size and content, their circulation figures are less meaningfull than those of newspapers (which are fairly standard) and periodicals are therefore dealt with separately in sub-section H below.

In order to derive average weekly newspaper circulation per company, the data for national and regional daily newspapers were multiplied by six, except where it was known that no Saturday edition was published Weekly and Sunday circulation figures were included without adjustment[1].

All of the companies included in Tables II-10 to II-12 which publish newspapers are also included in Table II-13 but those which produce only national periodicals are excluded.

The analysis of circulation shows the existence in 1968 of a distinct oligopoly group of four firms - IPC, Beaverbrook, Daily Mail group and the Thomson organisation, with a combined share of 71.7 per cent of the market. By 1975 the oligopoly, as identified by the first minimum of the Linda index comprised five enterprises - Reed, (having acquired IPC), News International (which took over and developed the Sun newspaper), Beaverbrook, the Daily Mail group and the Thomson organisation. These five firms combined share of the market was also 71.7 per cent. Much of the apparent decline in concentration is due to the changed position of IPC/Reed, whose share of total circulation fell from 29.4 per cent in 1975 to 22.0 per cent in 1968.

Table II-14 summarises the interests of the companies in the oligopoly groupings in each of the main categories.

Table II-14 Newspaper Circulation of "Oligopolists" (000)

	National dailies	Regional dailies	All Sundays	Local weeklies	Weighted Total
(a) 1968					
IPC	6,100	527	11,479	40	51,281
Beaverbrook	3,853	848	4,238	0	32,444
Daily Mail & Gen.	3,010	2171	0	480	31,566
Thomson Organisation	401	1462	1,711	323	13,212
News International[1]	0	41	6,191	245	6,682
(b) 1975					
Reed International	4,018	627	9,324	45	37,239
News International	3,435	37	5,560	294	26,686
Beaverbrook	2,894	485[2]	3,786	22	23,597
Daily Mail & Gen.	1,730	1641	0	488	20,714
Thomson	327	1495	1592	393	12,917

[1]Not in oligopoly in 1968.

[2]London Evening Standard, Mon-Fri only in 1975.

Table II-13 Table of Concentration - Aggregate for each company of average weekly circulation of newspapers

		1968	1975
Sum total for sample (000's)		179,317	168,909
% of total for all companies		91.8	93.8
Number of companies		26	28
Sample mean		6897	6032
Coefficient of variation		1.77304	1.55
Gini coeff.		0.71795	0.691
Herfindahl-Hirschman		159.3716	121.5
Entropy		-98.0929	-106.3
n* = 4	CR	71.7	64.1
	L	0.565	0.364
n*=8	CR	85.9	83.8
	L	0.559	0.395
n*h		2	2
Ln*h		0.732	0.698
CRn*h		46.69	37.84
n*m		4	5
Ln*m		0.565	0.364
CRn*m		71.7	71.7
LS		0.696	0.476

Comparison between Tables II-13 and II-12 shows the much greater concentration of newspaper circulation than of press turnover. There are two reasons for this :- (a) most of the lower-circulation newspapers and periodicals are more expensive than the most popular newspapers and (b) the popular press relies on advertising for a much lower proportion of its revenue. Both these aspects were described in sub-sections A and B above.[1]

In spite of the apparent variety of publications, the involvement of the largest press companies in both national and regional newspapers means that about 67 per cent[2] of <u>all</u> newspapers (national, regional or local) in the United Kingdom are published by only five enterprises. Two of the five (news International and the Thomson Organisation) are owned by overseas parent companies.

F. REGIONAL MARKETS

The analysis of regional markets takes two forms. First, the variable "aggregate weekly circulation for each company" has been calculated for each of six parts of the United Kingdom and the standard concentration indices of the Commission applied to it. Secondly, in order to complement corresponding studies in other member countries of the Community, we have calculated concentration ratios for individual <u>titles</u> of newspapers in each of the six regions.

In seeking to measure "aggregate weekly circulation for each company" we were obliged to find some way of allocating the circulation of national newspapers between regions. For this purpose, the National Readership Survey 1975[3] was used. This shows the distribution of <u>readers</u> of each title by each of six survey regions listed below :-

	<u>Total population aged 15+ (1975)</u>
London and South-East	14.5 millions
South-West England & Wales	5.4 "
Midlands	6.7 "
North-West	5.0 "
North-East and North	6.1 "
Scotland	3.8 "

The boundaries of these regions are shown on a map which appears as Appendix C to this report.[4]

Data on Northern Ireland are not available. The Royal Commission suggests that the circulation of U.K. newspapers in Ulster is less than that of the provincial daily papers,[5] of which the combined circulation in 1975 was 300,000. If this is true, then <u>less than</u> 2 per cent of the U.K. circulation of national newspapers is in Northern Ireland.

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1 Pages 62 and 56. .
2 Takes into account 93.8 per cent coverage of sample.
3 Published by the Joint Industry Committee.
4 On page 111 below.
5 Royal Commission 1974-77, Final Report para 3-18

For estimation of the circulation of national newspapers in the six parts of Great Britain, listed above, Northern Ireland sales have been ignored and the U.K. circulation has been allocated between the six "regions" in proportion to the results of the Readership Survey.

Table II-15 shows the estimated circulation of newspapers of each of the four categories in each of the six geographical areas and in Northern Ireland. Sales of newspapers published for one region are assumed to be confined to that region except that allowance is made for sale of the Scottish Sunday Post in North-East and North-West England. Discrepancies between the combined circulation figures in Tables II-15 and LL-8 are explained by differences in sources.[1]

Table II-15 Circulation of U.K. and Regional Newspapers 1975

Region	National dailies	Regional dailies	Sundays	Local weeklies
London & S.E.	5811	2257	7882	4235
S.W. & Wales	1835	937	2928	1370
Midlands	2337	1731	3656	1301
North-West	1767	1219	2764	1313
North & N.E.	1869	1640	2964	1063
Scotland	703	1610	3043	1217
N. Ireland	neg.	300	93)	
Other islands	neg.	36	neg.)	463
Total U.K.	14322	9730	23330	10962

Some distortion arises because some regional newspapers circulate in adjacent areas of other regions, e.g., the Liverpool Daily Post, included here in North-West England, circulates extensively in North Wales and in the Isle of Man. These adjacent areas are, however, thinly populated and this mitigates the distortion.

Table II-16 requires careful interpretation because of the varying coverage by our sample companies of each regional market. The true concentration ratio CR_4 can be obtained by multiplication of the ratio shown in the table by the percentage of total newspa newspaper circulation covered by the sample. The resulting figures (the proportion of all newspapers which were published by the four largest companies) follow on page 89.

[1] The discrepancy for local weeklies between Royal Commission estimates and those of the Press Council are discussed by the Royal Commission in Research Paper 5 (Cmd. 6810-6) 1977.

Table II-16 shows the standard concentration indices of the Commission applied to aggregate average circulation per company in each territorial division.

Table II-16 Table of Concentration - Estimated aggregate circulation of newspapers by region 1975

	London & S.E.	Wales & S.W.	Midlands	North West	N. & N.-East	Scotland
Sample total (000's)	52587	19961	28423	18962	23090	16895
No of firms	16	11	14	13	11	12
Mean	3287	1814	2030	1459	2099	1408
Coeff. of Variation	1.26	0.84	1.00	0.87	0.74	1.08
Gini	0.627	0.470	0.540	0.469	0.417	0.566
Herf.-Hirschman	161.7	155.0	143.1	134.6	141.1	181.0
Entropy	-89.3	-87.4	-92.6	-95.1	-90.6	-81.9
n* = 4 CR	77.5	73.0	69.7	67.0	65.2	75.9
L	0.319	0.348	0.332	0.343	0.368	0.412
n* = 8 CR	94.1	97.6	94.0	90.7	95.7	98.2
L	0.524	0.518	0.379	0.329	0.330	0.682
n* h	2	2	2	2	2	2
CRn*h	43.0	41.5	39.3	38.1	38.5	47.1
Ln*h	0.593	0.616	0.378	0.729	0.698	0.954
n* m	4	7	5	4	5	6
CR n*m	77.5	94.6	79.9	67.0	76.6	95.3
Ln*m	0.319	0.333	0.308	0.343	0.304	0.336
LS	0.436	0.396	0.389	0.510	0.460	0.527
Sample total as % of grand total	87.0	95.4	96.8	86.8	91.7	90.6

Region	Conc. Rates (4 firms)	Names of Firms and % share
London & S.E.	67.4	Reed (20.3) Beaverbrook (17.1) News Int. (16.1) Daily Mail (13.9)
Wales & S.W.	69.7	Reed (21.9) Daily Mail (17.8) News Int. (17.2) Beaverbrook (12.8)
Midlands	67.5	Reed (19.7) News Int. (18.4) Daily Mail (16.7) Iliffe family(12.7)
North-West	58.2	Reed (19.6) Beaverbrook (13.5) News Int. (13.0) Lvrpl.D.P. (12.1)
North & N.E.	59.8	Reed (20.6) News Int. (14.7) United News (13.1) Thomson (11.4)
Scotland	68.6	Reed (27.4) Thomson (14.4) Beaverbrook (13.9) Scot.& Univ.(13.1)

This list together with the information in Table II-16 shows considerable concentration in each region but, apart from the market leadership of Reed in all six areas, there is considerable difference in the ranking of companies in different regions.

Table II-17 is a table designed by the European Commission to show the evolution of competition among leading newspaper titles in each region. It shows that the Daily Mirror continued to lead in daily newspapers in 1975 (though it was not profitable - the Mirror Group section of Reed International made a loss in that year) ; the share of the Mirror was considerably reduced in all areas, mainly because of the advance of the Sun.

In Scotland, the Daily Express was published from Glasgow as the Scottish Daily Express until 1974. Since then, a Scottish edition has been published from Manchester. As a result the Glasgow-published Daily Record, owned by the Reed Group and a sister paper to the Daily Mirror has taken over the position of leadership in the Scottish market. We estimate that newspapers published in Scotland accounted for nearly 70 per cent of Scottish daily newspaper circulation in 1975 ; these include the evening papers of the large cities. The Glasgow Evening Citizen, published by Beaverbrook, closed in 1973, despite a circulation of 167,000 in 1972. This has resulted in increased sales for the rival Evening Times.

Further observations on regional concentration

The Royal Commission has published a Research Paper on regional concentration.[1] This does not aim to provide global statistical measurement but examines a number of specific topics. Among these are the decline in competition at local level, i.e., evening newspapers serving restricted areas and among local weeklies. The decline of freesheets as advertising itself declined from 1973 is another aspect of this. Between 1961 and 1974 eleven newspapers were launched and nine were closed. The launches were mainly in

[1] Royal Commission on the Press (1974-7) : Concentration of Ownership in the Provincial Press.

TABLE II-17 REGIONAL CONCENTRATION OF DAILY NEWSPAPER TITLES IN THE UNITED KINGDOM

REGION	YEAR	Total (000) circulation daily newspapers	Index			4 leading titles			
			C4	4L	C1	I	II	III	IV
London & S.E.	1968	8897	61.0	1.792	23.8	Mirror	Express	Telegraph	Mail
	1970	8661	57.3	1.752	22.4	"	"	"	"
	1972	8338	56.9	1.584	21.1	"	"	Sun	Telegraph
	1975	8044	57.2	1.596	19.1	"	Sun	Express	"
S.W. & Wales	1968	2777	52.8	2.464	23.8	Mirror	Express	Mail	Bristol Ev.Post
	1970	2698	50.6	2.316	22.6	"	"	"	Sun
	1972	2733	50.7	1.840	19.2	"	"	Sun	Mail
	1975	2745	57.8	1.712	19.7	"	Sun	Express	"
Midlands	1968	4046	54.4	2.044	23.6	Mirror	Express	Birm.Evg.Mail	Mail
	1970	3931	50.3	2.032	21.1	"	"	"	Sun
	1972	3779	54.0	1.608	19.9	"	Sun	Express	Birm.Evg.Mail
	1975	4084	52.4	1.612	17.3	"	"	"	"
North-West	1968	3442	58.5	1.292	16.7	Mirror	Express	Manch.Evg.Nws.	Liverpool Echo
	1970	3298	58.4	1.356	17.5	"	"	"	"
	1972	3222	57.3	1.356	17.2	"	"	"	"
	1975	2981	56.3	1.304	17.9	"	"	"	Sun
North & N.E.	1968	3837	44.2	1.992	17.9	Mirror	Express	Mail	Yorks.Evg.Post
	1970	3771	44.1	2.116	18.7	"	"	"	Sun
	1972	3492	48.1	1.972	18.7	"	Sun	Express	Yorks Evg.Post
	1975	3543	47.8	2.104	18.2	"	"	"	"
Scotland	1968	2471	62.6	2.488	25.7	Express	Record	Evg.Tms.	Evg. Citizen
	1970	2403	63.2	2.488	25.3	"	"	"	"
	1972	2409	62.7	2.704	25.8	"	"	"	"
	1975	2311	61.4	2.364	27.1	Record	Express	"	Sun

C4 = Concentration Ratio for 4 leading titles
C1 = Concentration Ratio for 1 leading title
4L = Linda Index for n* = 4

expanding commuter towns or were redesigned versions of established papers. All of the closures resulted in cities or towns like Birmingham, Leeds, Nottingham, Bristol, Manchester, Edinburgh and Glasgow having only one evening paper. In most cases, the newspaper was owned at the time of closure by the same company as the surviving rival though in some cases it had been acquired only a few years earlier.

Local monopoly in provincial daily and weekly newspapers means a monopoly of local advertising. To check whether this affected advertising rates the Royal Commission undertook a detailed survey and while they were able to find factors which significantly influenced advertisement prices, the existence of competition was not among these factors.

G ANTI-MONOPOLY LEGISLATION AND LOCAL NEWSPAPERS

The 1965 Monopolies and Mergers Act introduced and the 1973 Fair Trading Act continued specific provisions with respect to the Press. Transfers of controlling interest (25% or more) in individual titles require the consent of the Secretart of State for Prices and Protection who must (except in certain circumstances) refer the proposed transfer to the Monopolies and Mergers Commission. The Secretary of State may give consent without reference to the Commission when he is satisfied that the title to be acquired is not economic as a separate newspaper and must give consent if he is satisfied that such an uneconomic newspaper will no longer be produced as a separate title. (This means that the legislation has not prevented two owners of evening newspapers from acquiring rival titles which were making a loss and closing them - in Coventry in 1965 and Glasgow in 1974). Reference to the Monopolies and Mergers may also be waived when the circulation of the affected title is less than 25,000 or if the case is one of urgency, so that delay might threaten the survival of the paper.

The transfer of the Sun from IPC to News International (then the News of the World organisation) was not referred to the Monopolies and Mergers Commission, on grounds of urgency. The take-over by the Thomson Organisation of the Times in 1966 is the only case involving national newspapers considered by the Monopolies Commission. Five cases involving local weekly newspapers were considered during the period covered by our study. The acquiring companies were all national chains :- Thomson, S. Pearson (Westminster Press), News International (Berrows), Daily Mail and General (Associated Newspapers) and Scottish and Universal, Investments (G. Outram).

Concentration in the local weekly press has increased substantially since 1961 but most of the changes took place before 1968. Our own estimates of changes between 1968 and 1975 are shown in Table II-18.

Table II-18 Ownership of Local Weekly Newspapers 1968-75

(Companies with aggregate circulation in 1975 of over 200,000 are listed)

	% of national circulation	
	1968	1975
BPM Holdings and other Iliffe interests	1.7	2.2
British Electric Traction	1.4	2.0
County Newspapers	2.4	2.4
Daily Mail and General	4.6	4.5
East Midland Allied Press	1.9	1.9
News International	2.3	2.7
Scottish and Universal	1.9	3.1
S. Pearson	7.0	11.6
Thomson Organisation	3.1	3.6
United Newspapers	2.1	2.7
F. Johnston	1.9	2.0

The Concentration ratio for the four largest firms in 1968 was 17 per cent ; by 1975 it had increased to nearly 23 per cent.

Although the tendency for the ownership of local newspapers to be concentrated in national chains may give rise for concern, the current level of concentration is still very low.

This national product-group approach is inappropriate in our view. In any one town the regional daily and local weekly newspapers may be owned by one single company which in many cases is also a publisher of a national daily. Many people buying each of these newspapers may be unaware of their common ownership - they may unknowingly be relying upon one single company for all their news and Press opinion. In practice the large chains are committed to the principle of editorial independence ; nevertheless, the potential danger that Press monopoly could be abused remains for the future.

H. CONCENTRATION OF PERIODICAL SALES

It has already been pointed out that the publishing of periodicals is organised on a much more atomistic basis than that of newspapers. For this reason and also because the BBC, whose Radio Times has a circulation of over 3 millions per week, could not be included in our sample of companies, this sample covers only about 70-75 per cent of the total sales value of periodicals in the U.K.

The variable used for analysis of concentration is the total value of annual retail sales of periodicals for each firm. This is the sum of the products for each periodical of its cover price, its average circulation per issue and the frequency of issue in 1975. The process of data-searching and manipulation was a lengthy one and the research was confined to 1975. The results, summarised in Table II-19 are rather surprising :-

Table II-19 Table of Concentration - Annual Retail Value of Periodical Sales 1975

Sum total of sample : £152.6 millions
Number of firms : 19
Mean value : £7.03 millions

Coefficient of variation : 2.007 Gini coefficient : 0.677
Herfindahl-Hirschman : 264.5 Entropy - -85.14

N*	4	8	N*h = 2	N*m = 12
CR	73.6	87.0	59.4	95.6
L	1.178	0.742	2.212	0.551

LS = 0.964

The surprising finding is the dominant position of Reed with 48.5 per cent of the market followed by Independent Television Publications (publishers of TV Times) with 11.1 per cent. Since our sample covers 70/75% of the total market, the Reed share of that total is about 34-35 per cent.

The Royal Commission estimated the Reed share of consumers' expenditure on consumer magazines to have 35 per cent in 1975 and pointed out that this represented a decrease of about 10 per cent since 1965.[1] Reed's share of sales of trade, professional and scientific journals is almost certainly less than 35 per cent but a precise estimate cannot be derived. Reed had 120 consumer magazine titles and 90 specialist periodicals in 1975.

The other companies important in the periodicals, according to our own survey results are D.C. Thomson, with consumer magazines and accounting for 8.7 per cent of the sample total; Daily Mail and General Trust with only three weekly magazines but with 5.5 per cent of the sample ; and Morgan-Grampian with four consumer titles and 33 specialist periodicals and with 4.5 per cent of the sample.

The periodicals market is very volatile and intensely competitive, in the sense that market shares within individual segments have changed rapidly.

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1 Royal Commission 1974-7 Periodicals and the Alternative Press, paras. 42-47

SECTION III - SURVEY OF CONCENTRATION IN THE PUBLISHING OF SCHOOL TEXTBOOKS

A. INTRODUCTION

In 1975 school textbooks accounted for 16.6 per cent of the total value of books sold by U.K. publishers. We were asked by the Commission of the European Communities to include in this report a survey of concentration in the supply of compulsory and recommended books (i.e. textbooks).

Before the description of the survey and its results, it is necessary to point out that the system whereby textbooks are supplied to pupils in the United Kingdom. In the case of schools administered by public local educational authorities (LEA) where 96 per cent of the total school population is educated, books are invariably supplied by the school on a loan basis to pupils; they remain the property of the school. This reduces the size of the total market for school textbooks. Having purchased books for all members of an age-group which is studying a particular subject (in a large school and in the case of a common subject like English this might mean 200 books), the school is under economic pressure not to change the textbook used in a subsequent year. Under a system where pupils purchase their own books, perhaps with the assistance of grants and with the support of a second-hand book market, the school is more free to adopt new texts.

In independent schools (4 per cent of the school population) the system varies from one similar to that in the LEA sector to one where pupils are invited to purchase books on a list supplied to them by the school, which might specify "compulsory" and "other recommended" texts. Some independent schools operate a mixture of the two systems.

In the further and higher education sectors (mainly for students aged 18 and over) the requirement that students buy their own books is fairly general and this is one reason why the sales of "technical and scientific" exceed those of school textbooks by about 17 per cent, despite the relatively small number of students.

B. DESCRIPTION OF SURVEY

Schools were divided into eight categories reflecting the varying structures of education in different local education authority areas:

Category reference		Age range
1	LEA Primary	5 - 9
2	LEA Middle	9 - 13
3	LEA Secondary Comprehensive	11 or 13 - 18
4	LEA Secondary non-selected	11 or 13 - 16
5	LEA Secondary selected	11 or 13 - 18
6	Independent Pre-preparatory	4 - 8
7	Independent Preparatory	8 - 13
8	Independent Upper	13 - 18

Note: comprehensive = covering all ability range, no academic selection
selected = with pupils who have been selected by examination or other criteria
non-selected = with pupils who, as a result of examination or other criteria, have not been selected for other schools.

When the age-range spanned by the school was greater than that in the category (e.g. some independent schools covered the 8 - 18 age-range; some LEA primaries took children from 5 to 11; some LEA schools in transition covered 9 to 18), the school was asked to confine its response to the specified age-range for the category.

Table III-1 shows the subjects for which schools in each category were invited to complete questionnaires relating to stocks of textbooks in use in the academic year 1976-7 and purchases for use during that year. Textbooks which independent schools listed for obligatory purchase by their pupils were also listed and included as purchases. The number of schools in the sample following this practice for most of required books was very small.

Table III-1 Coverage of Subject by Category

x = questionnaires relating to subject sent to schools in category at head of column

	1	2	3	4	5	6	7	8
English		x	x	x	x		x	x
Mathematics		x	x	x	x		x	x
Economics/Comm.			x	x	x			x
History		x	x	x	x		x	x
Geography		x	x	x	x			x
French		x	x		x		x	x
Other mod. languages			x		x			x
Latin					x		x	x
Physics			x	x	x			x
Chemistry			x	x	x			x
Biology			x	x	x			x
Music		x	x	x	x		x	x
Religion		x	x	x	x			x
Reading	x				x			
Arithmetic	x				x			

"Science" was included in some questionnaires for categories 2 and 7 but, since it became evident that, in the age groups concerned textbooks were not a major means of teaching, this was subsequently abandoned.

For Reading and Arithmetic, 100 questionnaires were sent to LEA primary schools and 54 to independent pre-preparatory schools. The intention had been to use progressive random sampling until statistically significant results were derived for each of these two subjects.

The response rate was low and, for these subjects, as with elementary Science, the definition of a textbook created problems both for the teachers completing the questionnaires and for the Cranfield staff administering the survey. Other teaching devices - visual aids, constructional and mechanical devices are also used; series of reading books are used in rotation with the same class and it is difficult to distinguish between occasionally used books and "textbooks".

For other subjects, questionnaires were sent to 40 schools within each of the categories of school indicated by x in Table III-1. For example, for History 240 questionnaires were sent out, to schools in each of six categories.

After a pilot survey, questionnaires were designed and sent to each of 140 local education authorities in England, Scotland and Wales with a request for permission to distribute them to schools in their areas. Of these, only six refused permission and two others suggested amendments to the questionnaires to make them more appropriate to schools administered by them (these amendments secured a good response from these schools).

Schools were finally selected from alphabetical lists[1] on a systematic sample basis (every n^{th} school). Each individual school was requested to complete questionnaires for two subjects, so that the total number of schools approached within each category (40 times the number of subjects included in the survey for that category) divided by 2.

Table III-2 shows the total number of schools approached in each category and the number which returned questionnaires at least partly completed.

Table III-2 Numbers of Schools Approached and Responding in Survey

		Numbers of schools		
		Approached	Returning with questionnaires at least partly completed	
				%
1	LEA Primary	100	13	13
2	LEA Middle	160	32	20
3	LEA Secondary Comprehensive	240	76	31.7
4	LEA Secondary non-selected	200	55	27.5
5	LEA Secondary selected	260	116	44.6
6	Independent Pre-prep.	54	7	(13)
7	Independent preparatory	176	32	18.2
8	Independent upper	260	59	22.7
		1450	390	

[1] LEA middle and secondary schools from the Education Authorities Directory; independent schools from the Dept. of Education & Science's list of approved independent schools; LEA primary schools from local telephone directories.

The total number of pupils in responding schools were LEA schools : 198,770; Independent schools : 33,490. While this represented a very small proportion (2 per cent) of the total school population of Great Britain, the sample would have been sufficiently large and cross-sectional to permit conclusions to be drawn if certain statistical limitations had not become obvious. These are described in sub-section C.

Coverage by Subject

Individual schools were unable to complete questionnaires for particular subjects, for example when the subject was not included in the standard curricula. This meant that the total number of subject-questionnaires received was substantially less than twice the number of schools which responded. The number of complete and usable questionnaires for each subject is shown in Table III-3:-

Table III-3 Numbers of Schools Included in the Analysis of Textbooks for Each Subject

Subjects	State School	Independent	Total
History	48	15	63
Maths	47	12	59
Geography	42	12	56
French	39	15	54
Physics	37	9	46
Religion	34	11	45
English	33	11	44
Biology	34	9	43
Chemistry	34	9	43
Music	35	4	39
Latin	19	13	32
Economics	20	4	24
Reading	16	6	22
Arithmetic	7	6	13
German	26	7	33
Spanish	12	2	14

C. STATISTICAL SIGNIFICANCE

Table III-3 shows that for some of the subjects questionnaires were returned by very few schools. One of the problems to be faced in analysis of results from this kind of survey is the establishment of sample error. What from this survey is the reliability of the results?

The sample size lies between two alternative estimations. First one could regard each

purchasing decision as a sample unit: this would increase the sample size to a very respectable level. It would however be invalid since purchasing decisions are not independent: there are complementary and consecutive textbooks which appear as individual titles. In addition, teachers at one school may have a preference for one particular approach to a subject which may mean interdependancies between purchasing decisions, not obvious to the recipient of a completed questionnaire. Existing stocks will inevitably influence the decisions.

Secondly the sample size might be viewed as the number of schools completing questionnaires for each subject but this would be too stringent for estimation of sampling error since it assumes that all purchases of textbooks for each subject at a school are completely interdependent.

No precise answer can be given to this problem but it is reasonable that the sample size for estimation of standard errors of estimates derived from the sample data could be at least 1.5 times the number of completed questionnaires for each subject.

D. ANALYSIS OF RESULTS - TOTAL MARKET

From details of purchases by each school and by using catalogues and other guides[1], we were able to calculate for each subject the retail value of sales by each of 92 publishers to schools in our sample. The total value of these sales (at retail prices and therefore including distributors' margins) was £141,400.

In the estimation of market shares, simple proportions of this total are not acceptable because the sum for all subjects of the retail sales of each company reflects the composition of our sample, which was not weighted in accordance with the importance of the subjects. It would also include no correction for uneven response rates.

The weighting of subjects in proportion to the number of pupils taking examinations was also considered but rejected, because the textbook requirements of scientific subjects at the school level of study are lower than those of more literary subjects. On the other hand subjects which are developing (like the sciences) or subjects which are being taught in new ways (like mathematics and even Latin) may also require more textbook expenditure.

It was decided to weight the percentages achieved by each company of retail sales value for each subject by an estimate of the retail value of purchases per member of the school population. The number of pupils included in this ratio was the total number in the relevant age-group, not the number studying the subject. When a school reported that it did not provide courses in the subject concerned but it fell within a category appropriate to the subject the total number of children in the relevant age-group (normally the total in the school) was taken into account. The final weight was calculated as follows:-

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[1] "Books in Print" (UK edition) was very valuable for this purpose

$$\frac{\text{Expenditure on subject}}{\text{Total no. in schools (or age-division)}} \times \text{Proportion of total school population in age-group concerned}$$

Pupils in independent schools accounted for 14 per cent of all pupils in sample schools, compared with a national independent to total ratio of around 5 per cent. Following an initial computation which used weights uncorrected for this different composition, it was decided to test whether a correction would be worthwhile. This would have taken the form, for subject i

$$Wi = 0.04Wi \text{ (independent)} + 0.96Wi \text{ (LEA)}$$

The weights were virtually unaffected and, in view of the small sample of independent schools for some subjects, no correction was subsequently made.

The only weight which did require correction was that for Latin; since only independent and state secondary selective schools were invited to reply for this subject its importance for the total school population would have been overstated without further correction. The weight for Latin was derived by multiplying the weight derived on the basis of independent and selective schools by a factor of 0.25.

The resulting final weights are shown in percentage terms in Table III-4.

Table III-4 Subject Weights for Combination of Retail Value of Textbook Sales 1976-7

%

Mathematics	16.0	Biology	4.9
Reading	13.5	Religion	3.7
Arithmetic	13.5	Chemistry	2.0
Geography	11.5	German	2.0
History	9.2	Music	1.6
French	7.8	Economics	1.4
English	6.5	Latin	1.0
Physics	5.1	Spanish	0.3

These weights (Wi) clearly give a high weighting to primary school books. This result is not unexpected because all schoolchildren learn Arithmetic and Reading and these are two areas in which innovation has been considerable in recent years. Physical wear of books in primary schools may also be greater.

Developments in the teaching of mathematics, especially the more widespread adoption of modern mathematics, explain the high weight given to mathematics. On the other hand, while English is essentially a literary subject purchases of major literary works are likely to be confined to wear-and-tear replacements.

The market share of each company j, with percentage share Sij of the sales value of subject i was defined as

$$Sj = \frac{\Sigma WiSij}{\Sigma Wi}$$

for i = 1 to 16 subjects
and j = 1 to 92 companies

The standard indices of concentration were applied to Sj and are summarised in Table III-5

Table III-5 Table of Concentration - Adjusted Share of Value of Purchases by Companies 1976-7

Number of enterprises	:	92	
Mean value	:	1.038 (% of total)	
Coeff of variation	:	2.515	
Gini	:	0.816	
Herfindahl-Hirschman		76.32	
Entropy		- 135.2	

n*	4	8	10	n*m =	19	n*h =	2
CR	45.8	63.3	69.3	CRn*m =	88.1	CRn*h =	31.5
L	0.555	0.342	0.294	Ln*m =	0.189	Ln*h =	0.724
				LS =	0.337		

Names of four leading companies and % share

Subsidiaries of S. Pearson (Longman, Ladybird, Penguin, Oliver & Boyd)	18.6
Schofield & Sims	12.8
Addison-Wesley	8.7
Heinemann (subsidiary of Thomas Tilling)	5.6

The interests of two of the four companies - Schofield and Sims and Addison-Wesley are almost entirely confined to books for primary schools. The S. Pearson subsidiaries cover the entire range, though (mainly through the Ladybird series) they accounted for 38 per cent of the value of purchases of reading books by the 22 schools in the sample which reported on reading.

The concentration ratios demonstrate the fragmented structure of the market for textbooks. The absence of any minimum of the Linda index until the nineteenth firm shows that there is no effective "oligapolistic arena". The atomistic structure of book publishing, already described in Section I is reflected in the pattern of supply of school textbooks.

E. ANALYSIS OF RESULTS BY SUBJECT

Table III-6 shows the four firm concentration ratios for each of the 16 subjects, (a) for retail value of sales revenue and (b) for stocks of textbooks in current use. The stocks figures summarise cumulative purchases over a period of years and may also indicate the

likelihood of replacement purchases in the future.

Table III-6 Analysis of Concentration by Subject (CR for 4 Firms)

Subject (Weight %)		CR4	Names of TWO Leading Companies
Arithmetic	(a) Sales	96.8	Addison-Wesley (64), Schofield & Sims (26)
	(b) Stocks	88.4	Addison-Wesley (43), Schofield & Sims (43)
Biology	(a) Sales	78.0	John Murray (30), Pearson (23)
	(b) Stocks	73.8	Pearson (31), John Murray (23)
Chemistry	(a) Sales	58.5	Oxford (16), Heinemann (11)
	(b) Stocks	62.4	Pearson (34), Heinemann (13)
Economics	(a) Sales	63.3	Macmillan (22), Pearson (14)
	(b) Stocks	51.7	Macmillan (16), McGraw-Hill (13)
English	(a) Sales	57.6	Schofield & Sims (20), S. Pearson (17)
	(b) Stocks	47.5	Pearson (18), Schofield & Sims (11)
French	(a) Sales	70.7	Pearson (30), Hodder & Stoughton (18) (inc. affiliates)
	(b) Stocks	77.1	Pearson (36), Hodder & Stoughton (22)
Geography	(a) Sales	46.2	Pearson (16), Oxford (14)
	(b) Stocks	50.9	Macdonald (15), Pearson (13)
German	(a) Sales	83.8	Oxford (33), Hodder & Stoughton (28)
	(b) Stocks	61.5	Oxford (27), E.J. Arnold (20)
History	(a) Sales	52.1	Pearson (32), Scottish & Univ. (9)
	(b) Stocks	55.4	Pearson (35), A & C Black (8)
Latin	(a) Sales	86.4	Cambridge Univ. Press (67), Pearson (7)
	(b) Stocks	72.0	Cambridge Univ. Press (29), Pearson (28)
Mathematics	(a) Sales	47.9	Cambridge Univ. (16), Blackie (13)
	(b) Stocks	58.5	Cambridge Univ. (23), Pearson (18)
Music	(a) Sales	59.0	Oxford (33), Eulenburg-Schott (12)
	(b) Stocks	71.7	Oxford (37), Pearson (16)
Physics	(a) Sales	79.6	John Murray (30), Pearson (17)
	(b) Stocks	87.2	Pearson (36), Heinemann (23)
Reading	(a) Sales	98.7	Schofield & Sims (54), Pearson (38)
	(b) Stocks	77.9	Pearson (37), Schofield & Sims (18)
Religion	(a) Sales	44.9	Hulton Educ. (14), Pearson (14)
	(b) Stocks	38.6	Hulton Educ. (12), Pergamon (10)
Spanish	(a) Sales	100	Harrap (58), Pearson (18)
	(b) Stocks	96.2	Harrap (71), Hodder & Stoughton (28)

Table III-6 shows that the market for textbooks for certain individual subjects is led by companies other than the large general publishers. Of the leading two companies in each subject area, only S. Pearson, Heinemann (subsidiary of Thomas Tilling), Macmillan, Hodder and Stoughton and Scottish and Universal Investments are included in the general publishing sample. John Murray, Harrap, Schofield and Sims, Addison-Wesley, Hulton Educational and Macdonald all had sales turnover of under £3 millions in 1975 but, by specialisation in one or two specific subject areas they were able to gain the predominant share of the market in those areas.

The Oxford and Cambridge University Press organisation were not included in our financial analysis because they do not publish accounts. McGraw-Hill is the only American company in the list of leading publishers in each area - if the analysis had been extended to higher education, this position would have changed substantially.

Table III-6 also shows that the supply of textbooks for individual subjects is more concentrated, in every subject except religious education, than the educational market as a whole. This again reflects specialisation. In some cases a distinct oligopoly may be said to exist - in the sale of books for Arithmetic, Reading, Biology, Physics, French, German, Latin and Spanish four firms accounted for over 70 per cent of books sold to schools in our sample.

The survey of educational publishing provides a view of concentration only at a single point in time. It would be interesting to analyse data over a longer period to see how market shares changed with fashions, product innovations, advertising and prices. The analysis of stocks provides some guide as to cumulative purchases and the study has been of value in providing a benchmark for future assessment of concentration, but major conclusions cannot be drawn from a single survey of fairly limited size.

Appendix A Definitions and Basic Properties of Concentration Indices

In this explanation of the main indices specified by the Commission and used in this analysis the following notation is used :

N — total number of firms in the industry ;

x_i — the value of a variable for Firm i, when firms are ranked in descending order with respect to that variable ;

X — the aggregate of the variable for the whole industry, that is,

$$\sum_{i=1}^{N} x_i$$

P_i — the proportion of the aggregate accounted for by Firm , that is,

$$\frac{x_i}{X}$$

μ — the arithmetic mean value of the variable, that is, $\frac{X}{N}$

(a) Concentration Ratio

The concentration ratio for R firms within an industry is the fraction of the total value of the variable accounted for by the R largest firms ranked in descending order of that variable :-

$$CR_{(\%)} = \frac{100}{X} \sum_{i=1}^{R} x_i$$

Concentration ratios give only limited information about the structure of an industry. With different distributions of the variable, comparison of degrees of concentration between different sectors may depend on the number of firms chosen. In industry A the top five firms may account for 40 per cent of sales and the next five 30 per cent (giving a ten-firm CR of 70 per cent). In industry B the five largest firms may account for 50 per cent of sales and the next five 18 per cent (giving a ten-firm CR of 68 per cent).

(b) Coefficient of Variation

This is the standard deviation of the distribution of values of the variable as a proportion of the mean

$$V = \frac{1}{\mu}\sqrt{\frac{\Sigma(X_i-\mu)^2}{N-1}}$$

(c) The Gini Coefficient

This coefficient ranges from 0 (all firms equal in size) to 1 (all output in the hands of a single firm). The following formula provides a method of calculation when the values of the variable are ranked in ascending order $x_j, x_j+1, \ldots x_N$)

$$\frac{I}{NX} \sum_{j=1}^{N} (j-1)F_j - jF_j - 1$$

$$F_j = \sum_{k=N-j+1}^{N} x_k$$

(d) Herfindahl-Hirschmann Index

This was suggested by Herfindahl and is defined as the sum of the squares of the market shares, i.e.

$$\text{Herfindahl-Hirschmann Index} = \sum_{i=1}^{N} P_i^2$$

The index lies between $\frac{1}{N}$ and 1. Some authors prefer to define it as :

$$\text{H-H} = 1000 \sum_{i=1}^{N} Pi^2$$

i.e. to inflate its value by a multiple of 1000. This convention has been adopted by the Commission and is followed in this report.

The index is related to the coefficient of variation and in other publications by the Commission in this series has been defined accordingly :-

$$H\text{-}H = \frac{1000(V^2 + 1)}{N}$$

(e) Entropy

This is defined as :-

$$\text{Entropy Index, } E = -\sum_{i=1}^{N} P_i \log P_i$$

If one share is 1 and all others are 0, then E=0 and the degree of concentration is maximum. If all shares are equal ($=\frac{1}{N}$) then E = -log N and the degree of concentration is minimum for that value of N.

The entropy index, explained at some length in the Cranfield report on the paper industry, has the advantage over other measures of concentration that absolute changes in its value may be compared. For example if the Gini coefficient moves from 0.3 to 0.5 in one industry and from 0.7 to 0.9 in another, it cannot be concluded that concentration has increased to the same degree. With the entropy index, such a conclusion could be drawn. (10)

(f) Linda Index

Another measure of industrial concentration is given by Linda.

$$Q_i = \frac{K - i}{i} \cdot \frac{Ai}{1 - A_i}$$

where $A_i = \frac{1}{X} \cdot \sum_{j=1}^{i} x_j$ and values of x are in descending order.

K may be any number of firms from 2 to N. (Thus Q_i is the average share of the market held by the top i firms divided by the average share of the market held by the other $(K-i)$ firms included in the sample).

The Linda Index is defined as :

$$\frac{1}{K(K-1)} \quad = \quad K - 1 \Big/ \sum_{1}^{} Q_i$$

(i.e. the Linda Index is $\frac{1}{K}$ times average of the Q_i's).

The Linda index is designed to measure the degree of inequality between the values of the variable included in a sub-sample of K units.

The Linda Index may also be used to define the boundary between oligopolists within an industry and the other firms. This boundary occurs when the value of $\frac{x_k}{x_{k+1}}$ is so large in relation to previous ratios that, in spite of averaging, the Linda index rises. If the value of the Linda index (L) is greater for (k+1) than for (k) then an "oligopolistic arena" of k firms may be identified.

Mathematically this critical point (k_m) may be defined as where

$$\frac{dL}{dk} = 0 \quad \text{and} \quad \frac{d^2L}{dk^2} > 0$$

A measure of "synthesis" (LS) is included in the Tables of Concentration. This represents the mean value of the Linda indices from k=2 to $k=k_m$. LS is used in further statistical development of the analysis of concentration now being undertaken by the Commission.

The definition of k_m (N^*_m in the Tables of Concentration) on this basis differs from that used in earlier reports published by the Commission. This re-definition follows further analysis of the concepts underlying the Linda approach.

In certain of the concentration tables and matrices, reference is made to Ln*h, which is the maximum of the Linda index within the entire sample. Usually this maximum occurs at n*=2, in which case Ln*h is simply the ratio of the largest to the second-largest value of each variable.

APPENDIX B HOLDINGS BY NEWSPAPER COMPANIES IN COMMERCIAL TELEVISION AND RADIO
30th JUNE 1975

1. TELEVISION

Name of TV contractor and issued equity in £'s (voting/non-voting)	Press holdings of issued equity (% of voting/non-voting)	
Anglia Television (77,000 1,023,000)	East Midland Allied Press	(2.0/0.6)
	Eastern Counties Nwspapers	(9.4/6.4)
	Guardian & Man.Evg. News	(20.9/3.7)
	Non-sample companies	(0.5/0.3)
Associated Television Corporation (150,000 10,307,528)	Reed International	(29.6/21.2)
	Beaverbrook	(8.0/ 5.5)
	BPM Holdings	(5.0 / 0.9)
Border Television (12,000 517,500)	Scottish & Univ.	(13.9/19.1)
	Non-sample companies	(29.3/25.2)
Channel Television (146,979 0)	Non-sample companies	(28.8/ -)
Grampian Television (18,000 282,000)	Non-sample companies	(2 .0/2.0)
Granada Television (700,000 270,000)	Nil	
HTV Group (52,000 2,526,181)	Bristol Evening Post	(2.6 / 0.9)
	Non-sample company	(1.9 / 2.6)
London Weekend Television (15,000 2,005,000)	News International	(9.6 / 38.2)
	Daily Telegraph	(8.9 / 6.9)
	Observer	(8.9 / 5.2)
	Economist	(3.8/ 2.2)
	Non-sample companies	(2.3 / 0.5)
Scottish Television (28,000 517,500)	Thomson Organisation	(25.0/24.2)
Southern Television (100,00 -)	Daily Mail and General	(37.5/ -)
	D.C. Thomson	(25.0/ -)
Thames Television Ltd. (500,000 3,500,000)	British Electric Traction (see note at end of TV list)	(49.9/50.0)
Trident Television Ltd. (153,106 3,340,364)	United Newspapers	(8.2/ 5.3)
	Non-sample cps.	(1.2/ 0.7)
Ulster Television Ltd. (88,750 511,250)	Non-sample cos	(6.2 / 1.6)
Westward Television Ltd. (20,000 964,933)	Beaverbrook	(0.05/0.04)
	Bristol Evg. Post	(0.05/0.04)
	Reed International	(0.02/0.02)

NOTE The BET holdings in Thames Television are not listed by the IBA as press holdings in television because BET is not primarily a newspaper company. Nevertheless, the company does supply around 10% of local weekly newspapers in the area covered by Thames Television.

Share of total equity owned by sample companies (excluding BET) = 17.2 per cent
Share of all Press companies (excluding BET) = 18.0 per cent
Share including BET = 25.5 per cent

2. RADIO

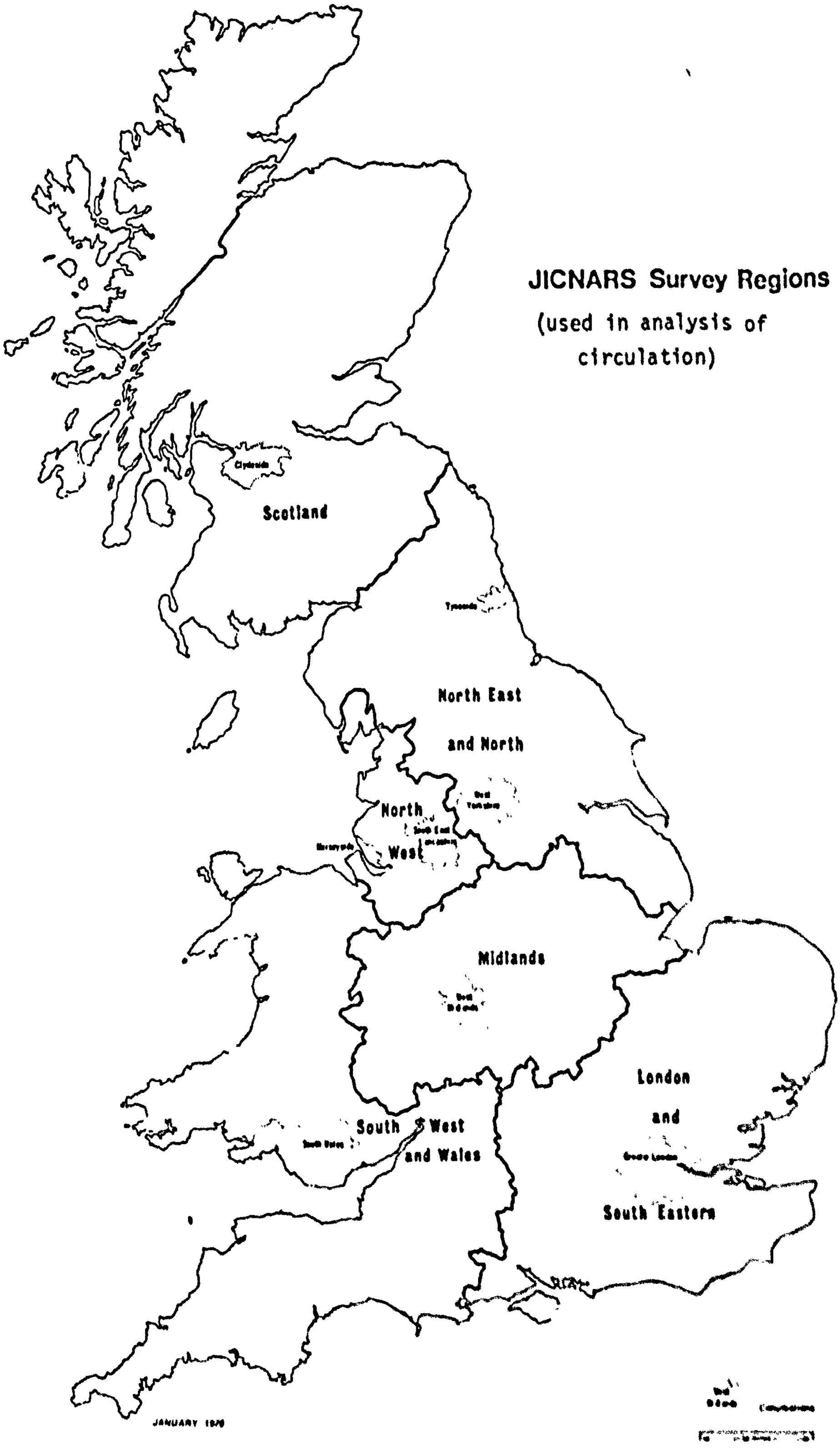
Name of Radio Company and Equity in £'s (voting/non-voting)	Press holdings of issued equity (% of voting/non-voting)	
London Broadcasting Company (1,249,125 nil)	Daily Mail & Gen.	(15.9/ -)
	County Newspapers	(3.7/ -)
	Non-sample co.	(0.1 / -)
Capital Radio (429,356 nil)	Beaverbrook	(5.2/ -)
	Observer	(5.2/ -)
	B.E.T.	(17.0/ -)
	Non-sample co.	(11.4/ -)
Radio Clyde (600 300,000)	Beaverbrook	(10.0/15.0)
	Scot. & Univ.	(12.0/12.0)
	Reed International	(6.5/ 6.5)
	Non-sample cos.	(3.5 /3.5)
Birmingham Broadcasting (50,000 300,000)	BPM Holdings	(10.0/15.0)
	News International	(2.0/ 2.5)
	Midland News Assoc.	(1.0/ 2.0)
	Non-sample cos.	(8.0/ 6.7)
Greater Manchester Ind. Radio (130,000 130,000)	Daily Mail & Gen.	(2.5/ 2.5)
	St. Regis	(11.1/11.1)
	Guardian & Man.Ev.N	(10.1/10.1)
	Non-sample cos.	(12.2/ 9.7)
Metropolitan Broadcasting (Tyne/West) (330,000 nil)	Thomson Org.	(15.4/ -)
	S. Pearson	(2.3/ -)
	Prtsmth & Sund.	(2.3/ -)
Swansea Sound (15,000 nil)	Daily Mail & Gen.	(12.44/ -)
Radio Hallam (220,000 nil)	United Newspapers	(13.0/ -)
	Non-sample cos.	(9.0/ -)
Radio City (Merseyside) (100,000 200,000)	Liverpool Post & Echo	(11.0/15.0)
	Thomson Organisation	(2.0/ 2.5)
	Non-sample cos.	(11.0/16.0)

Radio Forth Ltd. (135,000 -)		Thomson Organisation	(6.8/ -)
		D.C. Thomson	(6.4/ -)
		Non-sample cos.	(4.5/ -)
Plymouth Sound Ltd. (1000,000 -)		Bristol Evening Post	(14.0/ -)
		Reed International	(10.0/ -)
Sound Broadcasting (Teeside) (25,000 100,000)		Thomson Org.	(12.0/ 12)
		Portsmouth & Sund.	(8.0/ 8.0)

Total press involvement in equity

Sample companies only (exc. BET)	18.8	per cent
Sample & non-sample cos. (exc. BET)	23.6	" "
Total including BET	25.5	" "

APPENDIX C.



JICNARS Survey Regions

(used in analysis of circulation)

APPENDIX D

PROFILES OF MAJOR COMPANIES

In 1975 six companies formed an "oligopolistic arena" as defined by the Linda curve. These were Reed International, the Thomson Organisation, S. Pearson and Son, Associated Newspapers (Daily Mail and General Trust), News International and Beaverbrook Newspapers.

Apart from Reed International, these companies had at the end of 1975 an unusual common feature - a controlling (or a very large minority) interest was in the hands of one family:-

Thomson Organisation Ltd., a wholly owned subsidiary of the Thomson Equitable Corporation Ltd. of Canada. The Thomson family trusts owned a majority of the equity of the Canadian parent.

S. Pearson and Son Ltd., which owned 63.6 per cent of the publishing firm Pearson Longman Ltd., is largely owned by the family of Viscount Cowdray. The Cowdray family's proportion of issued voting shares appears to fall short of a majority (it is around 45 per cent) but this gives effective control.

The Daily Mail and General Trust Ltd., which owns 51 per cent of the publishing firm Associated Newspapers Ltd., is jointly controlled by Viscount Rothermere and his son, the Hon. Vere Harmsworth, who hold 56 per cent of the voting capital.

News International Ltd., is effectively controlled by Mr. Rupert Murdoch and his family, whose company News Ltd. of Australia holds 48.3 per cent of the voting capital.

Beaverbrook Newspapers Ltd., was until the 1977 takeover by Trafalgar House Investments controlled by the Beaverbrook Foundation and the family of Lord Beaverbrook, the Aitken family with about 75 per cent of equity.

The activities of the three largest of those companies - Reed, Thomson and S. Pearson (combined turnover 39 per cent of the industry) are discussed further in this Appendix. The other three members of the oligopoly grouping are essentially newspaper publishing companies: their activities have been extensively analysed in Section II of the main report.

1. REED INTERNATIONAL

This company was formed in 1969 when the Reed group acquired the International Publishing Corporation. Total turnover and net profits before tax in 1975 amounted to £1063.6 millions and £37.4 millions respectively. Printing and publishing accounted for 24.1 per cent of turnover and 19.9 per cent of profits. Other activities include paper and paper products, decorative products and building materials.

The company's share of combined sample turnover declined from IPC's 26.3 per cent in 1968

to 18.9 per cent in 1975. This was due to a number of factors including the sale of the Sun newspaper to News International in 1969 and the emergence of the Sun as a major competitor for the Daily Mirror; the decline of some of IPC's general consumer magazines and a decline in the circulation of popular newspapers in general.

Attempts by the Mirror Group to reorganise production have met with resistance and Reed's publishing activities have never since recovered their 1968 level of profitability.

Net profits per cent of Turnover IPC/Reed publishing activities

1968	:	7.1	1972	:	4.5
1969	:	4.8	1973	:	2.6
1970	:	1.8	1974	:	2.2
1971	:	5.0	1975	:	4.0

Of the total publishing turnover of £292.6 millions in the year ended March 1976, newspapers accounted for £106.2 millions, consumer magazines for £81.5 millions, business periodicals for £44.6 millions and books for £26.6 millions.

2. THE THOMSON ORGANISATION

This company expanded its holdings of U.K. newspapers in the 1960's, though some of the titles then acquired were subsequently closed as uneconomic. The group's activities in publishing include the Times and Sunday Times newspapers (17.6 per cent of company turnover but making a loss in 1975), Scottish and regional newspapers (22.6 per cent of turnover but also recording a loss in 1975) and other publishing (magazines, books and classified telephone directories - "yellow pages"), which made a profit of 7.7 per cent on sales.

The Thomson Organisation's losses on its publishing activities reflect the decline of classified advertising, which is the principal source of revenue both for "quality" national newspapers and for the regional press.

Over the eight years covered by the study, the Thomson Organisation's return on sales of published matter varied as follows. These variations reflect the prosperity of regional newspapers until the recent recession.

Net profits per cent of Turnover of The Thomson Organisation's publishing activities

1968	:	11.7	1972	:	11.0
1969	:	9.5	1973	:	12.9
1970	:	10.0	1974	:	10.6
1971	:	7.7	1975	:	-2.2

The company's share of sample turnover in 1975 was 11.0 per cent, compared with 11.5 per cent in 1968.

Thomson's non-publishing activities, which account for 40.1 per cent of turnover, include a large travel organisation with a wholly owned airline, Britannia Airways.

3. S. PEARSON AND SON LTD.

Pearson Longman Ltd. the publishing subsidiary has interests in all categories of newspapers and in books. Our study has shown that its leadership in the local weekly press, which it has furthered by acquisitions during the study period. We have also indicated on the evidence of the purchases of 390 schools, that the company is the market leader in the supply of educational books.

The paperback subsidiary, Penguin Ltd., developed a wide range of economical paperbacks many concerned with scientific and technical subjects.

A breakdown of the total turnover of S. Pearson and Son in 1975 (£184.6 millions) shows publishing activities accounting for 59 per cent, of which provincial newspapers accounted for over half. Book publishing produced 11 per cent of total turnover.

Other Pearson activities include merchant banking and the administration of investment trusts.

Mainly because of its provincial newspaper acquisitions, Pearson's share of total turnover in publishing (from our sample) rose from 6.5 per cent in 1968 to 9.1 per cent in 1975. Profits of publishing activites as percentages of sales varied as follows:-

Net profits per cent of sales turnover - Pearson publishing activities

1968	:	6.3	1972	:	11.3
1969	:	6.0	1973	:	11.7
1970	:	5.4	1974	:	7.7
1971	:	7.1	1975	:	5.5

As with the corresponding figures for Thomson newspapers, the boom and subsequent recession in classified advertising revenue are reflected in these results.